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VITAMIN RESERVE, INTAKE AND DEFICIENCY STATES IN THE YOUNG CHICK

H. J. ALMQUIST

The Grange Co., Modesto, Calif., U.S.A.

Some years ago when the writer was engaged in research on vitamin K, chicks from parent hens with different vitamin K intake were placed on diets containing different levels of the same vitamin. Vitamin K influences the blood clotting power of the chick, hence measurement of time required for the blood to clot offered a quick test of the vitamin K adequacy in the chick, a test which could be made repeatedly without destroying the chick. Except when extreme, deficiency of the vitamin did not affect growth rate or feed consumption and these complications did not present serious difficulties in an effort to explain quantitatively the effects of the vitamin deficiency. In repeated tests the unexpected observation was made that while the diet of the parent affected the day-old chick the maximum effect was observed not during the first few days after hatching, but as much as two to three weeks later. After passing through a minimum, blood clotting power then began to improve with every level of vitamin K in the chick diet, indicating that dietary intake was becoming a larger and more adequate portion of the requirement. (1)

The tendency toward a minimum or most critical state in respect to certain other vital factors is observable, also, at two to three weeks after hatching. For example, the hemoglobin level in chicks passes through a minimum phase at two weeks and shows recovery by three weeks. (2, 3) The vitamin G dietary requirement of chicks is particularly critical for the first two weeks and decreases after that time. (4)

The tendency for the vitamin K deficiency to reach the most acute phase during the second to third weeks from hatching was explainable as due to the influence of the reserve stores of the vitamin in the chick. "The day-old chick weighs 30-40 grams and has a corresponding, definite and increasing requirement for essential food factors. However, the intake of such factors starts at zero from which it increases as the chick consumes food. The chick must soon obtain entirely from the diet the essential factors which it may have carried in reserve at time of hatching. During the first days of the chick's life, therefore, the reserve is being depleted pending

the acquisition of a sufficient quantity of essential food factors from the diet. When one of these food factors is limited by a low intake in the diet, the possibility of deficiency is greatly increased and, when the reserve of the chick is also low, a seriously deficient condition is almost certain." (1) At this point, it is of interest to add the observation that deutectomized chicks (unabsorbed yolk removed) show slower growth for the first two weeks, probably because of a loss of nutrient reserves. (5) In expression of the observations with vitamin K, using arbitrary units of vitamin potency, a figure such as that in Fig 1 was drawn. The conclusions which could be derived from this work most probably have general application to other nutrient factors.

In Fig. 1 are shown curves called *"Reserve"* relating the quantity of a vitamin in the chick to age under conditions when there is no intake from diet. It appeared that depletion of this quantity would probably follow a constant percentage rate, or a logarithmic curve. That this assumption was approximately true has been demonstrated since in the case of depletion of vitamin A liver reserves of cattle (6), and for vitamin D remaining in the chick (7). The liver vitamin A storage of chicks declines after hatching and does not begin to increase, even with ample intake of vitamin A, until after 2 weeks (8), (9). On the average, the reserve store of vitamin in the day-old chick should equal or exceed the requirement at that age, otherwise hatchability would be much impaired.

The amount of vitamin stored in the chick is related to that in the diet of the parent hen. Probably, it is also related to healthiness of the parent since diseases which would interfere with feed intake or feed utilization by the hen could also influence the transfer of vitamins into the egg. Furthermore, if the hen had been through some debilitating condition, her vitamin reserves might be depleted and the eggs laid for some time after apparent recovery might still contain sub-optimal amounts of certain vitamins. Very young hens which have been growing rapidly are not likely to have built up enough vitamin reserves so that they can deposit sufficient in the egg for all purposes. The depletion curves marked "Reserve" on the figures really designate total amount remaining in the chick both in use and in reserve.

The curve marked *"Requirement"* indicates the amount which should be present in the chick for a normal condition in respect to a vitamin. This curve starts out well above zero because the chick has a definite size and requirement when

hatched. This curve in most cases should resemble in shape a normal growth curve, since most requirements are related to body weight.

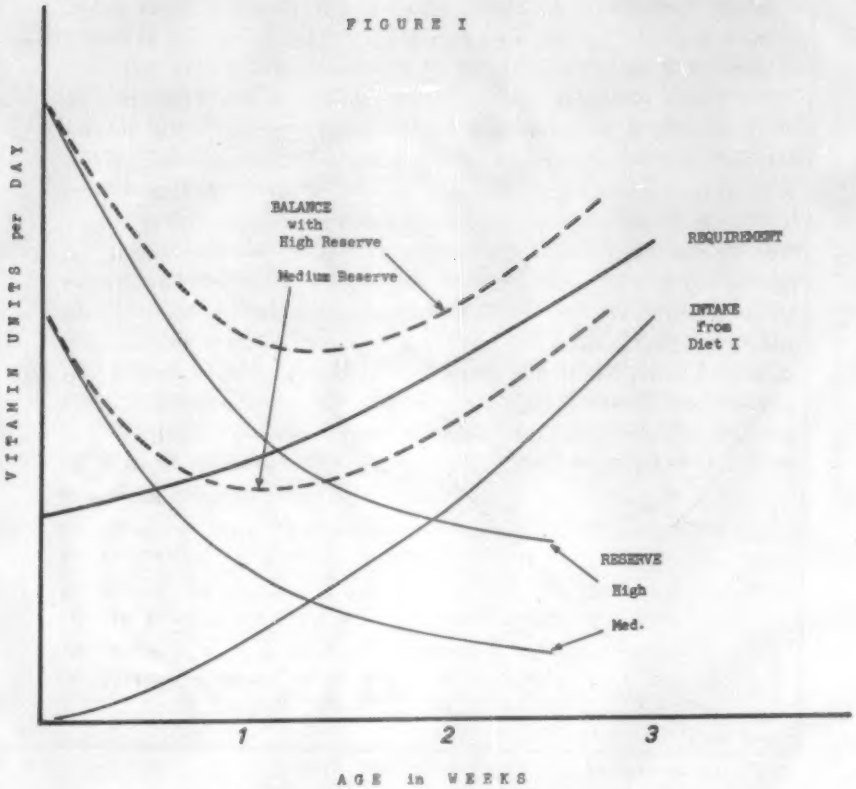
The curve marked *"Intake"* represents the daily intake from the diet and, obviously, will resemble a total food intake curve. The intake curve will have different slopes depending upon the concentration of the vitamin in the diet. Sometimes the chick, because of long transportation, will not receive any food for several days, hence the entire intake curve will be shifted to the right. In this case the delay in feeding might be decisive regarding the development of a deficiency state at later age. Sometimes, as in the practice of giving chicks only scratch grains for a few days, the intake of a vitamin may be negligible although the chick has been eating. Finally, any stress such as chilling, overheating, crowding, thirst, etc. which prevents the chick from eating enough food, will depress the intake curve. It will be noted that the normal intake alone cannot meet full requirement during the first week or so of life, but if the chick progresses as it should the dietary intake will eventually meet or exceed the requirement curve.

In chemistry, when the direction of a process is known from different points, intermediate stages of the process can often be estimated by summing up the curves representing the reaction started from other stages. It was assumed, therefore, that the situation of the chick with respect to a factor such as a vitamin could be estimated by adding the curve representing the reserve under conditions of no intake and the curve representing intake at any particular time. With vitamin K this assumption seemed to work quite well. The net status of the chick was, therefore, expressed as a fourth curve which was the sum of the reserve and the intake curves. This represented the condition of the chick in respect to amount of vitamins needed in the body, plus amounts destroyed or excreted or not absorbed from the diet. The latter fractions would be included, of course, in the total balance.

The "Balance" curve, like a bank account, represents the net result of deposits and withdrawals. When this net balance remains above requirement all is well, but when it dips below requirement the probability and severity of a deficiency state will depend upon how far the dip extends.

In Fig. I is illustrated the condition of a chick hatched with a medium reserve and given a barely adequate diet. (Diet I). Comparison of the balance with the requirement curves shows that this chick entered a deficiency zone after six days

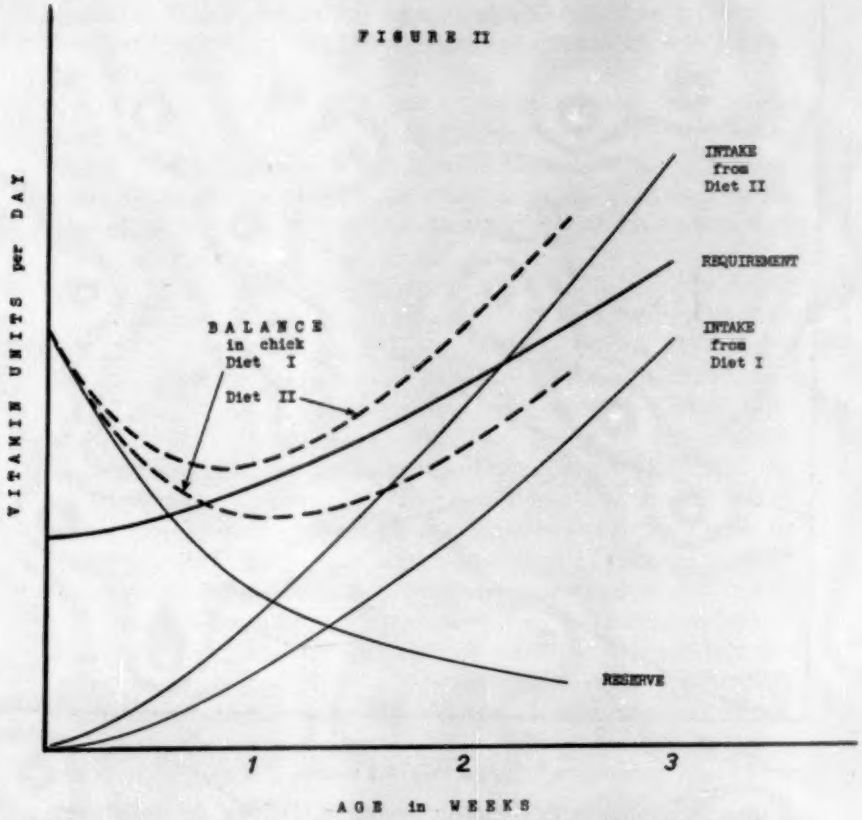
FIGURE I



and was probably developing actual pathology or deficiency lesions during the second week of age. If the deficiency in question also decreased feed intake then the balance curve would be depressed further and the chick would have very little chance to pull out of the condition. If, on the other hand, the chick did not descend too far into the deficient zone and could continue to eat well, the chick would have a chance, ultimately, to build intake up to a point where requirements would be met from food alone. This chick would then recover, spontaneously, in time. Under the same circumstances a chick with a high reserve, as also represented in Fig. I, would be able to maintain a balance above requirement through the critical period.

It is well known that individual chicks vary considerably in individual requirements, and the same diet which will sustain some chicks, will not save others from distinct deficiency. It has been observed many times that flocks in which certain individuals are showing definite nutritional deficiency

FIGURE II



lesions will contain other chicks that are apparently quite healthy. The writer has seen flocks of chicks and poults in which several different vitamin deficiencies were evident at the same time.

The same medium-reserve chick, represented in Fig. 2 as given a diet rich in the vitamin (Diet II), would rarely show a deficiency, but the high vitamin supplementation of such a diet might be impractical or non-economic. Such a diet might involve overfeeding 95 percent of the chicks with vitamins for the sake of 5 percent. The same chick, further hampered by crowding, or short of water, or chilled, or overheated, or not fed a good diet promptly, would almost certainly become deficient.

A chick with a high reserve store, as in Fig. I, will stand somewhat more abuse and stress without breaking down, but even this resistance is limited. For example, if it receives no food for two or three days, is uncomfortable, is given only

a mediocre diet, or not enough water, a deficiency state is possible.

A chick which is allowed to get into a deficiency state is, of course, an easy victim to infectious disease. The concept which has been discussed above presents an explanation of one method of operation of a so-called "stress factor," applied to the young chick or poult.

To sum up, deficiency states in young chicks are most likely to become apparent during a critical period of the approximate second and third week of life. The transference of vitamins from the maternal diet can be an influential factor during this life period of the chick. The reserve store in the chick is a safety factor which tides the chick over an early critical period until vitamin intake from diet can be built up to meet requirements. Intake must not be hampered by delayed feeding, incomplete diets or stresses which interfere with feed consumption and utilization.

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REPORT OF INTERNATIONAL CONFERENCE ON ANTIBIOTICS

World-wide interest in antibiotics led to the International Conference on the Use of Antibiotics in Agriculture, held at USDA in Washington. Sponsors were the National Research Council. Some 400 persons from the United States and 15 other countries attended.

The October conference was called to evaluate present information on growth and other responses of livestock to low-level antibiotic feeding, antibiotics in crop production and food preservation, the influence of agricultural uses of antibiotics on antibiotic-sensitive microflora, antibiotic effects on reproduction and carcass quality in livestock, antibiotic residues in human food, mode of action of antibiotics, and discussion of problems requiring research.

Unbelievably small amounts of antibiotics make pigs and chickens grow more and faster on less feed. This may become a major factor in agriculture everywhere, as it now is in the United States. As little as 10 grams (just over 1/3 ounce) per ton in the ration of hogs may increase growth 10 to 20 percent and save about 20 pounds of feed for every 100 pounds of animal gain, said T. J. Cunha, of the University of Florida.

Some researchers found that increased growth is often not present in young animals fed antibiotics and raised under the best conditions of nutrition and sanitation. But T. D. Luckey, of the University of Missouri, reported on some chickens and turkeys that showed growth response in a germ-free environment.

No effect of antibiotic feeding on reproduction has been demonstrated, but mortality in newborn animals is reduced in antibiotic-fed chickens, poults, pigs, calves, and lambs.

USDA research reported by N. R. Ellis showed that an extra pig or two per litter was weaned when the sow's diet was supplemented with an antibiotic during gestation and lactation. The extra pigs were due to better ability to survive to weaning.

Tests at USDA have indicated some beneficial carryover effects in chicks hatched from eggs of antibiotic-fed hens. Researchers now feel reasonably sure that antibiotics do no harm when fed to swine and poultry during the reproductive cycle.

There are probably four reasons for this growth-promoting effect, explained C. A. Baumann, University of Wisconsin biochemist. First, farm animals may be subject to many unknown diseases that are too mild to be recognized but nevertheless interfere with normal growth; the antibiotic checks thhe growth of the bacteria causing these diseases. Second, the antibiotics probably encourage the growth of other organisms that synthesize vitamins in the animal itself. Third, they may kill bacteria that normally compete with the animal for these vitamins. Fourth, they thin the intestinal walls, permitting better absorption of vitamins and other nutrients by the animal.

E. Freerkson, of Germany, supplied an additional hypothesis—that antibiotic feeding must result in supplying some directly essential substances, perhaps hormone precursors.

It was generally agreed that the mode of action of anti-

biotics must be determined in order to make further research fully effective.

The drugs also are important in treating costly livestock and poultry diseases, reported B. S. Pomeroy, of the University of Minnesota. Adding antibiotic to feed at the rate of 50 to 1,000 grams per ton, or to water at the rate of 25 to 250 parts per million, has proved quite effective.

Emergence of tolerant or resistant bacteria requires additional research. J. J. Christensen, of the University of Minnesota, reported on variation, including many mutations, occurring in fungi grown in media containing antibiotics. Apparently no mutants have yet been found in soil microflora as a result of antibiotics that were naturally produced there.

Antibiotics may affect heredity of lower organisms such as molds and thus be helpful in genetic study.

H. Clausen, of Denmark, gave evidence that low-level antibotic feeding had no adverse effect on carcass quality of swine under controlled feeding. He warned, however, that pigs allowed all the low-protein feed they would eat might become excessively fat since antibiotic feeding generally increases feed intake. Some U. S. researchers have reported that protein level may be decreased in the diet of antibiotic-fed pigs.

Ecology of antibiotic-producing fungi was discussed by two Russian scientists. E. N. Mishustin reported effects of antibiotics inhibiting the action of nitrogen-fixing bacteria. N. A. Krasilnikov reported plant protection against disease by absorption of antibiotics produced by fungi naturally occurring in the soil.

Application of antibiotics to plants for control of many diseases was reported by W. J. Zaumeyer, of USDA. The big problem now is to find antibiotics that are effective in sufficiently low concentrations to be economical for commercial crop use.

Rigorous tests for safety will delay the use of antibiotics in food preservation until the public can be fully assured that there is no health hazard from antibiotic residues.

(Agricultural Research, Vol. 4, No. 7—January, 1956
United States Department of Agriculture, Washington, D. C.)

F. A. O. REGIONAL TECHNICAL MEETING ON POULTRY PRODUCTION

S. G. IYER

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The F.A.O. Regional Technical Meeting on Poultry Production in Asia and Far East was held at Poona, Bombay State, India in October, 1955. Delegates from Cambodia, France, India, Philippines, Malaya, Viet Nam and F.A.O. Staff attended the meeting. Observers from U. S. Technical Co-operation Mission and World's Poultry Science Association also attended the above meeting. The Government of Australia, France, India, Malaya, Thailand and the United Kingdom sent interesting demonstration materials, photographs and leaflets for exhibition.

Status and importance of poultry production.—It was revealed that although in most of the Asian and Far Eastern countries, particularly Japan, India, Malaya, Pakistan, the Philippines, Thailand and Viet Nam efforts had been made for the development of poultry to meet the increasing demand for eggs and poultry meat; yet there remained the strong need for a more intensified and broader activity in the field of poultry production. The meeting recommended that in view of the important contribution which poultry can make towards an improved human diet and an increased income for the rural population, more emphasis should be given to the sound promotion of this valuable industry. Periodical sampling surveys on poultry numbers and production of eggs and meat should also be carried out to evaluate the progress made.

Improving poultry production through technical planning, cheaper housing, improved equipment and better management.—The meeting recommended that Governments and Associations should pay full attention to the planning and layout of a poultry unit, the type of houses and equipment, and issue suitable blueprints and leaflets. Poultry houses and equipment should be adapted to the local conditions using materials available in the area to reduce capital outlay.

Improved poultry production through breeding.—The subject was discussed at great length. It was pointed out that as the genetic progress depends on the heritability value of the character under selection multiplied by the selection differential and divided by the interval between generations.

the progress in breeding for egg production can be made at a rapid rate provided the interval between generations is kept to one year by breeding from pullets. However, the difficulty in breeding with pullets lies in the fact that at the time they are selected these pullets have been laying for a few months only. Fortunately the genetic correlation between this short period and annual egg production is very high.

While discussing about the choice of breeds the problem of geographical adaptation of poultry was considered. This problem of geographical adaptation is of considerable importance when attempting the importation of poultry stocks into a new region. The question is whether breeds of poultry developed in Europe and in America can be expected to do well in Asia and in the Far East. Whereas large animals show special adaptation to specific geographical areas, there is little experimental evidence to indicate that poultry have any important geographic adaptations. The fact was stressed that no one country has a monopoly of the most desired set of genes of the fowl and that the chicken is sufficiently adaptive to permit the use of concentrations of desired genes found anywhere in the World.

The meeting recommended that in order to replace the existing inferior flocks with more productive stocks, it is essential that sound breeding programmes on a national basis should be formulated, limiting the number of foreign breeds to as few as possible. The meeting also recommended that to transform the indigenous poultry population of an area into a more productive breed, up-grading should be applied as being an efficient method.

Improving poultry production through feeding.—It was pointed out that the feed conversion rate is influenced by genotypical and phenotypical factors, the contents of the nutrients in the daily ration and the quantity of feeding-stuffs possibly found in the runs or fields. It was also mentioned that the development of the poultry industry should not compete with the human needs for cereal grains. Hence the necessity arises for seeking a suitable Optimum between feed consumption and egg production. Although under certain conditions, even a relatively low egg production may be economically justified, the fact should always be kept in mind that a small amount of feeding stuffs rich in protein, energy, minerals and other supplements may often help to make up for some nutritional deficiencies thus resulting in a far better utilization of the total feed, stronger health, consider-

ably increased output and revenue. Hence, special attention should be given to the optimal use of indigenous feeding-stuffs. This involves further investigational and experimental work as well as adequate extension services.

The meeting recommended that Governments should undertake scientific investigation on the digestibility and nutritional value of poultry feeds, particularly those of indigenous origin, and provide the farmers with formulae for balanced mashes that can be easily prepared, making maximum use of farm and industrial waste products. Governments should encourage the manufacture and distribution of fishmeal, meat meal, and other essential poultry feed supplements at reasonable prices. The manufacture of commercial compound feed mashes for poultry should also be promoted both on a co-operative and private basis.

Prevention of losses.—The meeting recommended that since the prevention of losses in the poultry industry is largely dependent on good management and the efficient control of infectious diseases, parasites and predatory animals, increasing attention should be paid to the progressive education of all poultry raisers by the various Government services. The prevention and control of infectious and parasitic diseases should be considered an essential part of any national scheme for the development of the poultry industry in a country. Governments should also draw up sanitary and quarantine procedures, if not already in operation, to prevent the introduction of disease through the importation of eggs and poultry.

The meeting also recommended that as in tropical and sub-tropical countries, poultry may suffer or even die due to lack of proper transport facilities and that poultry products and feeding-stuffs deteriorate rapidly in the absence of adequate processing, transport and storage facilities. Governments and the public should co-operate to effect improvements in the direction.

Improving Institutions, Services and Marketing.—The meeting recommended that Governments should pay particular attention to the establishment of adequate training facilities in all branches of poultry production for research workers, poultry teachers, extension officers and farm personnel. Governments should assist and coordinate research projects and exchange the results of research obtained at various centres within the country, as well as, with other countries

of the region in order to make the most efficient use of the available resources in funds, facilities and scientific staff. Governments should make provision for an adequate extension staff both at the head-quarters and in the field who should be in close contact with poultry research centres, so that the rural population can benefit from the present day scientific knowledge in regard to proper management, breeding, feeding and disease control. National Poultry Improvement Plans should be regarded as a fundamental step to achieve improvement of a country's poultry industry. Governments should also assist the development of adequate processing and organized marketing of poultry products and support measures to increase their consumption.

Recognizing the most valuable contribution this first meeting was able to make to the Governments in Asia and the Far East, it was unanimously recommended that F.A.O. should consider organizing a second regional meeting on this subject, if possible in 1958, in order to discuss the progress made and the new problems which may have arisen in the meantime.

Besides the field trips, a special All-India Poultry Show was organized at Poona from 21st to 23rd October, 1955, in conjunction with the F.A.O. Regional Technical Meeting to demonstrate the improvement so far achieved in the development of the industry in India.

GERMANY—A MAJOR IMPORTER OF POULTRY

The Federal Republic of Germany is now the world's largest importer of poultry meat. Because of its large urban population, rising purchasing power and somewhat static poultry production, West Germany has now displaced the United Kingdom as the major poultry importing country. (Foreign Agriculture Circ. Feb. 1956, U. S. Dept. of Agr.)

HYBRIDS, CROSSES OR PUREBREDS—THE BEST FOR COMMERCIAL EGG PRODUCTION

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(The United Kingdom Branch of the World's Poultry Science Association held a conference in London on December 8, 1955 at which this subject was discussed. The results of this discussion by internationally known breeders are here presented.—Editor)

HYBRIDS

C.THORNBER

Hybrid chickens have hit the headlines in this country recently. There are now even a few firms daring to produce and sell hybrid chickens! Naturally, I don't know their approach to the breeding problems involved nor the particular techniques they are applying so I can, in this paper, only give an outline of how my own Company are breeding hybrid stock.

What is a Hybrid? In the simplest form it is merely utilising heterosis or hybrid vigour—the phenomenon whereby the crossing of unlike strains or breeds produces progeny having a better performance than either of their parents. Heterosis is not a new discovery for in poultry the practice of crossing different breeds has been carried out for many years.

So, you say, a first-cross is a hybrid? My reply to this is that the poultry breeder will admit a much narrower definition of the term in its relation to poultry. The hybrid breeder takes this matter of crossing breeds and strains a great deal further for he is unable to accept the idea that every cross must produce progeny superior to the parents. The first problem must be to find lines not only giving a good performance themselves but also a far superior performing progeny when crossed.

The second problem involves the use of the Breeder's own knowledge of breeding to improve each generation of those lines so that a better chicken becomes available.

The third major problem must be ability to repeat this work as often and in whatever volume required so that large numbers of chickens of pre-determined performance can be available.

The methods used by the Breeder to improve successive generations could be:—

(a) Incrossbreeding
(b) Recurrent selection
(c) Reciprocal recurrent selection
(d) Recurrent to Tester

or a combination of any two or more of the foregoing. This approach must—in my definition of a hybrid—be employed to qualify a chicken for the true title of hybrid.

Why is a hybrid likely to be best for Commercial Egg Production? I say strongly that it is so because the hybrid is designed exclusively for commercial egg production and its design is no mere chance. From the commencement of our breeding programme the only traits considered, measured and tested are those having an appreciable effect on profit.

These traits or economic factors are:—

(a) Egg Production
(b) Feed Conversion
(c) Liveability.

These are the three main factors. There are others, Rapid Feathering, Minimum Broodiness and, to enable the chicks to be sold as cheaply as possible, High Hatchability.

To deal with the three main factors in turn we must examine the hybrids' record for egg production first. The production records of hybrids in public Laying Trials—and particularly those where the teams are sent as random selected day-old chicks—during the past year are eloquent testimony. To select only one—in the 12th National Commercial Laying Test hybrids won first prize and laid 239 eggs per bird against an average for the Trial of 188 eggs per bird. An interesting side development which can be mentioned whilst considering egg production is that of breeding not only for high egg production but also for eggs of good shell texture so as to reduce losses attributable to shell defects. In the B.O.C.M. Cafeteria Hen Battery Trials 1954-55 held at Selby—where each bird in the team is housed in a different make of Hen Battery cage—the average of cracked eggs was 6.1 per cent but the hybrid team's loss under this head-

ing was only 2.7 per cent.

The second point of feed conversion is an unusual breeding factor in this country but it is one which can make a really substantial contribution to the Poultrykeeper's profit. There is, of course, a close correlation between bodyweight and food consumption and part of the breeding technique involved here is the use of smaller birds. As a rough guide, in laying stock each 1 lb. bodyweight over four pounds increases the food consumption by 10 lbs. per bird per year. When two-thirds of the total cost of a dozen eggs is accounted for by food, consumption cannot be ignored. Again, an illustration from those Public Laying Trials where this factor is measured—in the second month of the current B.O.C.M. Trials at Stoke Mandeville the pen of hybrids (6 birds), which are placed first, have consumed 96 lbs. against the 3rd placed team having consumed 144 lbs of food.

Turning to the matter of liveability which is undoubtedly the biggest problem facing the Poultry Industry. Of all the mortality which occurs, it is reasonably estimated that about one-half is due to the Leucosis Complex. Now it has been very clearly demonstrated by research workers, notably by Hutt and Cole at Cornell and by our own Dr. Coles that is is possible to breed strains of poultry with a marked degree of resistance to Leucosis. Our own work in this direction has been distinctly encouraging and a case in point is the B.O.C.M. 1955-56 500-Day Random Sample Trial where deliberate and heavy exposure to Fowl Paralysis was a basis of the Trial. From 0 to 160 days, the mortality from Leucosis amongst the 15 entries each comprising 40 day-old pullets varied from 2 to 9 birds per team with an average of 10.8 per cent with the exception of a team of hybrids which had no mortality through this cause. This is not, of course, to say that all hybrids are resistant to leucosis, for I know that they aren't only too well, but certain hybrids are amenable to breeding for such resistance and we are developing these as well as other lines showing promise.

To breed for a multiplicity of factors means that it is essential to carry out breeding research on a large scale. In experimental work alone we will be using some 1,100 males in individual breeding pens during the forthcoming season. Figures mean little but comparisons perhaps more. On average, most Breeders are using 10 males each season so our operations are equivalent to the work of 110 ordinary breeding

farms but with the important distinction that all our work is directed to the same end and the results co-ordinated. Or another comparison, I believe that there are some 400 Breeders in the Breeders' Grade of the Poultry Stock Improvement Plan so our work is equivalent to about one quarter of the whole of Breeders' Grade. With operations of this size there must be the greatest hope of continuous improvement. That we are carrying out such a programme is some indication of our faith in the results which it is producing and of our faith in the Poultry Industry itself. But scale of experimental operation alone is insufficient. Any breeding programme must have a testing programme of equivalent size—the two are inseparable. Our own testing work involves testing 80,000 pullets this year. None of this testing work is done on our own farms. It is all carried out by and on the premises of the co-operating poultrykeepers—these co-operators are poultrykeepers spread throughout England and Wales and their farms are in all ways similar to the average farm. This concept of testing is essential for it means that the experimental hybrid has to perform well under average farm conditions before being considered as a possibility for sale to Commercial Egg Producers.

CROSSES AND PUREBREDS

Y. WATANABE

These are days when there is less time in which to do the more and more that is necessary to deal with the increasing complexities in almost every phase of life. I have been asked to speak for twenty to twenty-five minutes on the subject of breeding pures and pedigree first crosses for commercial replacement stock—a very short time in which to deal with a very big subject and the only way in which to cover the ground, even quite briefly, seems to me to be by speaking as it were in headlines, leaving you to fill in the details for yourselves.

Let me say at once that, to my mind, no useful purpose would be served by a debate on "which is best—purebreds, pedigree first crosses, or hybrids?" There will always be good, bad and indifferent of all three. Purebreds and pedigree first crosses can be produced on farms of moderate size, whereas the breeding of hybrids requires resources that are available only to men in a big way of business. And, anyhow, only "time will tell."

Let us go back some thirty years and see how purebred utility stock used to be bred. The method employed was comparatively simple. Pullets intended for trap-nesting were selected by handling, and at the end of their year of lay were chosen for the breeding pens by a combination of the trap-nest records and more handling. The breeding pens were headed by suitably unrelated males of good egg pedigree and handling qualities and, "hey-presto," you could look forward to a new generation better than the first.

Do not imagine that in those days breeders did not practice progeny testing and family breeding. It would be more correct to say that these devices were largely limited to what could be carried in the head and were therefore used less completely, less systematically than they are today. It must be remembered that the most serious disease was B.W.D., which was soon mastered by the blood test and that there were a number of low production flocks in existence whose hen house average could be considerably improved by the simple breeding methods I have described.

It was not long before these methods were found to be inadequate, chiefly in two respects. First of all, they were found to be inadequate to improve egg production above a certain level which did not satisfy breeders or their customers. Also, the method gave no protection against the inroads of the leucosis problem when, in the 1930's, it arose in devastating form. The free introduction of outside blood, together with the absence, on most farms, of a good system of progeny testing, were two of the chief causes of the quick spread of leucosis in so many flocks in the industry. Indeed, the introduction of an apparently healthy looking male from an undesirable source could wipe out a strain in one or two years. It was this danger, more than any single other factor, that led breeders either to adopt the closed flock (line breeding) or to introduce new blood only very much more carefully, after much more testing, than before.

I, myself, am a believer in the closed or "line-bred" flock. Line-breeding can be defined as the confinement of the matings to related, though not necessarily closely related birds. In-breeding is line-breeding carried to an extreme and can be carried out in two ways—either by the mating of very closely related birds, such as mother to son or father to daughter or brother to sister or else by the very frequent introduction of one bird in the pedigee of a bird.

Now, it is hardly necessary to mention at a meeting like

this one that the effect of using very closely related matings is to "fix" and to accentuate characteristics, both good and bad. And as it would so easily be possible to accentuate lethal characteristics that are not apparent in the trap-nest record and outward appearance of a bird, it is essential, when line-breeding, to know much more than the performance of a bird. Above all, one wants to know: (1) is the family a desirable one or not and (2) how does the bird breed, as distinct from how does it perform? From the necessity to get an answer to these questions came the need for a good system of progeny testing.

My chief strain of Rhode Island Reds, and my strain of Light Sussex, have been line-bred for over twenty years. For a long time, I was troubled by the thought that "line"—and "in-breeding", "per se.", might cause degeneracy in the strain and so wipe it out. I am sure that if I had line-bred by a chart of relationships, this would indeed have come to pass. But where the birds used for line-breeding purposes are above-average birds for the strain and those used for in-breeding are just a few of the very pick of the very best families, then the general downward pull of the device "line-breeding" is more than offset by the upward pull in the use of these very picked birds. But see what this means. It means that whole families, including individuals that put up magnificent records and handle and look splendid specimens have to be thrown out, if the family is just average or worse. It means that one must face up to the tremendous work involved in an adequate Progeny Test. And, finally, it means that one must have at one's disposal a sufficient number of any one breed to enable one to throw out every bird of every family that the Progeny Test indicates to be undesirable. I would not, myself, care to try to do this work with less than 1000 adult birds of any one breed, even when dealing with quite good stock.

There are, of course, big rewards for the breeder who can face up successfully to the difficulties of line-breeding. It is a device that works usefully in two ways. The use of related stock brings weaknesses to the surface, so that undesirable individuals can be recognized and eliminated. Also, it enables a breeder to get the best out of desirable individuals in desirable families by a concentration of their "blood" (using this word in the sense in which it is understood by poultrymen). Desirable and undesirable individuals and, consequently, families, can only be recognized by the use of a well designed system of recording, including the Progeny Test.

On a business farm, as distinct from an experimental station, it is not possible to use a perfect Progeny Test. A perfect Test would necessitate no culling, and every casualty sent for post-mortem examination. On a poultry breeding farm where stock is sold and a profit has to be made, there is the necessity to keep the flocks well culled, so that no bird under par is allowed to remain among healthy birds, nor can one afford to send every cull for post-mortem examination. It is, however, possible to design a Progeny Test that will give the essential information: namely, which birds, and so which families, are outstandingly good, which are average and which are outstandingly poor for those qualities, including resistance to leucosis, that are deemed most desirable.

There is not time to describe in detail the Progeny Test that has gradually been built up on my farm. In brief, every special pen hen (which is housed in a small individually mated pen) has a breeding sheet on which is entered the wing-band numbers of all her chicks. The history, in lay terms, of what happens to every chick, male and female, is entered up to three months of age. From that date, only the history of the pullet progeny is entered. This is done to the end of the pullet year of lay. These breeding sheets readily disclose the essential information as to whether the mating produces above average, average, or below average stock.

I have devoted a good deal of the time at my disposal to the breeding of purebred pedigree stock. I make no apology for doing so, for only if the purebred stock is bred right can satisfactory commercial purebred or pedigree first crosses be produced. There is, to my mind, one fundamental difference in the principle employed for mating stock for commercial replacements as compared with mating foundation breeding stock. I have already expressed my belief that for foundation matings it is desirable for the birds mated to be related, and sometimes very closely related, because, for one thing, we want weaknesses to be shown up as much as possible in the next generation. In the case of commercial matings, however, the reverse is the case. Our aim here is to produce stock that will, for one generation, give as little trouble as possible. Matings designed to produce commercial replacements, therefore, should be as unrelated matings as possible. That is why I am so keen on the "Pedigree First Cross".

The pedigree first cross is, to my mind, the ideal way in which a poultry farm that is not too large, and one which is run as a complete unit, can supply consistently sound re-

placements. There is no limit as to how good these can be. The breeder can continue to the end of his life to work for improvement in the breeding (and management—though I will not enlarge on this aspect of the problem) of his purebreds, and so of his pedigree first cross. The two purebreds used must, of course, be suitable breeds and both must be bred right and, I believe, line-bred right for the desired qualities. If they are, then I do not think there need be any fear of the two families to "nick". My own commercial replacement matings are the daughters of the previous season's special pens, mated to picked males of the opposite breed and I use the Rhode Island Red and the Light Sussex, crossed both ways. I believe that there is something to be gained from what is known as "hybrid vigour", but this is not the chief purpose behind the use of unrelated matings. These, I believe, should be used, not so much for any gain in vigour, as to be sure to avoid any accentuation of weaknesses through the use of a closely related mating.

Up to a few years ago, I also supplied purebred commercial replacement stock in Rhode Island Reds. For this purpose, and again in order to avoid any accentuation of weaknesses through closely related matings, I bred a second and somewhat unrelated strain of Rhodes, mating "A" strain males to "B" strain females and vice-versa. Results were very satisfactory but the pedigree first cross gives all the advantages of completely unrelated matings, including such useful qualities as an exceptionally good rate of feathering. That is why, today, our commercial matings consist only of the pedigree first cross.

The selling of commercial replacement stock is a very satisfying business. If the customer finds your stock is profitable to buy, he wants more next year and the year after, whereas, if you sell an expensive individually pedigreed sitting, your satisfied customer will not want to come back to you for many years! There is no limit to the interest you can derive from pedigree work on the purebreds used to make the commercial cross. Mr. Thornber, I am sure, will agree that neither he with his hybrids nor I with my pedigree first cross will ever achieve our target. We can only strive for the stars and gradually get a little nearer. How lucky we are! For "to travel hopefully is a better thing than to arrive, and the true success is to labour."

SUMMATION

G. E. MANN

It is well-known that living things, even of the same kind, are not all alike. They vary a good deal, especially in utility performance. Part of this variability is due to environment, for we cannot provide a completely uniform environment for every bird or animal. The other part of variability is genetic. It is based on genes which are transmitted from one generation to another and are capable of a certain amount of control in the hands of the breeder. It is, in fact, his job to concentrate the right genes by selection, and then to exploit them by the right kind of matings.

So far as utility characters are concerned, this genetic variability is of at least two kinds:—

(1) based on additive genes, selection for which improves *general* combining ability; and—

(2) based on dominant interacting genes within large gene complexes, selection for which improves *specific* combining ability. You call this nicking or hybrid-vigour; the scientist calls it heterosis.

Now, as a scientist, I must insist that any breeding plan that aims at exploiting *both* types of gene action is likely to be more successful in the long run than a system that relies solely on one type of action only.

All conventional breeding to date has been based on these additive genes. There may have been some nicking here and there, but is has seldom been exploited systematically. In the hands of skilled pedigree breeders like Mr. Watanabe and others, stocks have been developed which have high additive gene value and have therefore been widely and successfully used for upgrading purposes. We may call them Breeders' Grade stocks. But, by breeding in this narrow, conventional way, selection pressure declines with each succeeding generation, with the result that genetic gains and upgrading value also fall off. It is an established fact, moreover, that—sooner or later—you reach a plateau of breeding performance where these additive genes become so fixed that they no longer respond to conventional selection. To climb above this ceiling, you must then introduce fresh blood and start again. In doing so, you at once upset one of the very things you need, uniformity, reliability in breeding performance.

One last point about this system of breeding. If you mate

two different strains or breeds together and depend on additive gene values only, then the avearage performance of the offspring will be half-way between that of the two parbreds.

Selection for heterosis, however, presents a very different picture. Whichever of the new systems you employ (and the choice depends mainly on the capital resources at your command and the speed with which you want results), you are not only concentrating the genes that produce specific combining ability but you can pick up the additive genes on the way. Admittedly, you cannot predict this nickability; you have to search for it. But, once you have found it, you can exploit it if you set about the task in the right way.

In theory, therefore, I am convinced that systems of breeding based on heterosis must prove superior in the long run, at any rate so far as characters of low heritability are concerned—such as egg production and liveability.

But—and this may indeed surprise some of you—no scientist is content with mere theory; he wants to test it and see results for himself, just like the layman.

So, how do these "hybrids" work out in practice?

They have had some spectacular successes recently, as Mr. Thornber has told you. On the other hand, I must admit that, here and there, samples of pure or crossbred stock have beaten hybrids in open competition. But these are only small samples. Can their performance be repeated at will by the parent stocks as a whole? In other words, are these parent stocks sufficiently uniform? If they are, can they be expanded quickly and cheaply, so that they can compete with hybrids in open commercial competition? Again, are you quite sure that these successful samples of pures and crossbreds have been produced by conventional breeding, or have they in fact been pre-selected on a basis of nicking? We just do not know; but I have my own ideas, especially about the value of small samples without records of repeatability.

It is my own conviction, after studying these matters pretty closely both here and in America, that the *average* hybrid is worth about 1½ doz. eggs more than the *average* ordinary commercial pure or crossbred layer. And that, after deducting the premium on the day-old chick, means about five shillings a bird to the commercial egg producer. But my own opinion is not *proof*. So go ahead and organize as many divided flock tests as you can—tests run by farmers *for* farmers. They must be correctly laid down, these tests, but

the NAAS can help you here. Average results from these tests, carried out in a wide range of environments and from year to year, will settle the issue.

My summing up is therefore in favour of Mr. Thornber and of hybrids generally, so long as we are talking about egg production. Table birds are a different story altogether. I should like to add just this. The present day conception of breeders' grade stock is based on the assumption that its purpose is to upgrade inferior stocks. I suggest that, in the near future, we shall have to amend this to read: "A breeders' grade stock is one that has high genetic uniformity and which has been proved to nick when mated with selected stocks of the same kind." When this new definition is accepted, breeders will cease trying to sell stock for upgrading. They won't sell their selected stock at all—except possibly under licence—they will sell the strain or breed cross, in which all the available heterosis has been released. And they will sell this as commercial, not breeding, stock.

Did you notice that I said—"They will sell the strain or breed cross." Yes, you can exploit heterosis through the medium of strain-crosses, i.e. crosses between different but selected strains of one and the same pure breed. And, if you do this, you will be in the rather curious position of selling *pure hybrids*. And then, both Mr. Thornber and Mr. Watanabe will be right.

One last word, if I may. You do *not* need enormous capital resources and a resident geneticist in order to breed for heterosis. The system known as Reciprocal Recurrent Selection will not produce results overnight, but it will produce them at a reasonable speed; and it can be started with just two good flocks of 1000 or even 5-600 birds each.

I see no reason why pedigree breeders should not adapt themselves to this new system, either as individuals or in small partnerships in which the small man could play his part, if not in actual progeny-testing, at any rate in multiplying the selected stock.

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Reviewer:

W. D. TERMOHLEN

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Hatchery Operation and Management. Funk, E. M. and Irwin, M. R. Publisher—John Wiley & Sons, Inc., New York, N. Y., 1955. 349 pages. Price $6.50.

A review of the history of the poultry industry of the United States clearly shows that it has been in the last fifty years that the setting hen has been replaced by the incubator of the commercial hatchery. The development of the commercial hatchery industry has been especially rapid since the 1920's. Today the hatchery industry has developed into an important branch of the poultry industry. The commercial hatchery business has become highly competitive and it seems safe to assume that in the future only the highly efficient operators will survive and enjoy reasonable profits.

In this book the authors have briefly traced in the first two chapters the history of the use of artificial incubators and the development of the hatchery industry in the United States. A short chapter highlights the hatchery and its equipment with further discussions regarding equipment found in other chapters. Hatchery customers today demand quality and performance. Consequently coverage is given on flock selection, pullorum testing, poultry improvement, breeds, varieties, strains, crosses and grades of chicks, measurements of chick quality and prevention and control of disease in the hatchery.

Costs and therefore factors affecting hatchery profits are ably covered in several chapters. These items are of especial interest because in general the hatchery business is a low-margin-of profit business. The baby chick is a highly perishable product and because of the prevailing low profit margins the chick must have a buyer when it is hatched. Bearing this fact in mind the authors have utilized about 100 pages of the book to cover in four chapters the subjects of advertising, selling, organization of the hatchery work, hatchery correspondence, office procedure and chick delivery methods. These four chapters in themselves will bring real dividends in knowledge and practice to the purchaser of this book.

The book is written in a manner to be of interest to

students studying poultry husbandry and also experienced hatchery operators. In this respect it shows the value of combination of authors with many years of teaching, research and practical business management experience. The authors have accomplished their hope that "Hatchery Operation and Management" would serve students, hatchery operators as well as persons in other phases of the poultry industry as a helpful reference guide.

This book relates to chickens and does not cover turkeys, ducks, etc. However basic principles of management and business covered can have application to hatcheries specializing in other types of poultry. (*W. D. Termohlen*)

Commercial Poultry Production. Marble, Dean R. and Jeffrey, Fred P. Publisher—The Ronald Press Company, New York, N. Y., 1955. 415 pages. Price $6.00.

The authors are both able and experienced teachers and research workers in poultry husbandry. Fred P. Jeffrey was recently appointed Associate Dean of the School of Agriculture and Horticulture at the University of Massachusetts. Dean R. Marble has taught and conducted research in poultry husbandry at Pennsylvania State University and Cornell University. He has also operated a poultry farm of his own for many years. Both authors have contributed many articles to popular poultry journals.

The book consists of 16 chapters and has 110 illustrations and 69 tables.

The commercial production of eggs and poultry meat (chicken, turkey, duck, goose) has become a dominating and important factor of the poultry industry. As time passes it will become more important, with general farm production becoming less and less important. The authors have written "Commercial Poultry Production" from a business standpoint to be used for the basic or beginning college course and as a reference guide for extension workers and commercial poultrymen and to those engaged in sales and service aspects of the poultry industry.

The first chapter covers the Poultry Industry in the United States and is of interest primarily to students.

Chapters 2, 3 and 4 covering poultry breeding, selection of foundation stock, culling and breeder selection are well written in simple and understandable language and give an excellent background on these subjects.

Two chapters relate to feeding. First the formulation of poultry rations is covered through a discussion of nutritive requirements and then how these requirements can be met. Mention is made of the importance of environment in determining the response of a bird to any diet.

Stress factors such as bacterial stress, temperature stress and genetic stress are mentioned all too briefly though it is understood that some stress factors are conjectural such as disease, age, sex and management. These are however all factors to which the commercial poultryman must pay increasing attention.

Feeding practices are covered in the other chapter with general feeding practices and comparative feed requirements rceiving special attention.

Management methods receive attention in four chapters: Hatchery Management, Brooding and Rearing, Housing the Laying Flock, and Laying Flock Management.

Helpful information on marketing of eggs and poultry are to be found in two chapters. Poultry equipment is covered by being interwoven into various chapters particularly those on management, feeding, and marketing.

As is usual in books of this type there is a chapter on Poultry Diseases. However in the some forty pages devoted to this subject no more than a mere description or pathology of various diseases is given because emphasis is given to the importance of good breeding, sound nutrition and alert management in preventing or controlling diseases.

Very appropriately attention is given the business side of the poultry industry in a chapter entitled "The Economics of Poultry Farming."

Specific reference to turkeys, ducks and geese not covered in other chapters receive attention in chapters 15 and 16.

If a person expects to get an extensive bibliography as a reference source he would be disappointed because very few references are given. This is a practical book and it is written in a practical manner based on the wide experience of the authors. Technical subject matter is included only when it has practical importance. For the teacher and student the discussion questions at the end of each chapter are very useful. —A good book for the undergraduate student, the extension worker, the industry service people and the practical commercial poultry farmer. (*W. D. Termohlen*)

Turkey Management. Marsden, Stanley J. and Martin, J. Holmes. Publisher—Interstate Printers and Publishers, Inc., Danville, Ill. 6th Edition—published October, 1955. 999 pages. Price $7.00.

"Let's talk turkey" and "talking turkey" are expressions used frequently in the United States to refer to getting the conversation down to the business at hand. Marsden and Martin really talk turkey in the sixth edition of "Turkey Management" and they do it in a manner interesting and with real value to the grower of turkeys and anyone else who talks, thinks or lives turkey.

The authors, Stanley J. Marsden and Dr. J. Holmes Martin need no introduction to turkey people anywhere in the world, and especially in the United States. They are recognized authorities on turkey production. One of the best recommendations for this book is the fact that this is the sixth edition since the book was originally published in 1939. It means it is a popular book and it is up-to-date.

In the preparation of the sixth edition the authors have stated in their preface that this is a rather complete revision. They also clearly indicate the fact that this edition is aimed for the producer and his problems. In doing this the authors have arranged the chapters in the order in which they believe the turkey producer will be confronted with problems involved in turkey management, and accordingly they start with purchased day old poults. They express their hope that the sixth edition will find itself on the turkey growers shelf. Your reviewer would recommend that every turkey grower and every person who sells poults, feed, supplies, services, etc. to growers should have this book in a prominent spot on their bookshelves or even better yet in a convenient place on their desk for ready reference.

It may be possible that some research workers, teachers and in rare instances students, especially graduate students, may criticize the book because it does not have a long list of references either at the end of every chapter or the end of the book. However since the authors have aimed this book for the grower who is more interested in basic facts and information, than he is references. Messrs. Marsden and Martin should be congratulated for this sound step. They have conserved space by having only about three pages of references out of 999 pages of text. It is about time, and especially with the higher cost of books, that books are not taken up with so many pages of references. Throughout the text of the book credit is given and brief reference made for findings since 1945 right up to

early 1955. Examples: "In pelleted 20% protein growing mashes Almquist (1953) suggested a fiber level of '6 percent or more' for ranged turkeys." "The Beltsville Station (1952) showed that a fat content of 6 to 7% in the starting diet was conducive to increased tenderness and juiciness in frying age turkeys." "The North Dakota Station (Bimo. Bull. 1953) found that hatchability of all eggs set from Beltsville White and large white turkeys (January through May) was 8 percent less in eggs held 14 days than in eggs held 7 days. Eggs held 21 days hatched 22 percent less than those held 14 days. Holding temperature was 45 to 50° F which may have been below the optimum." This method does a good job by telling the facts and giving all the reference that is needed. If one wants to follow up the reference with a *little work* they can get it. Congratulations again to the authors, may more writers of text books follow this example.

The 17 chapters cover the whole gamut of information turkey growers should know or have at their finger tips; through starting the poults, rearing, feeding, sanitation and diseases, marketing, and also origin, history, classification, varieties, breeding and incubation. The 60 page Appendix covers turkey production data, National Turkey Improvement Plan, periodicals, state colleges, diagnostic laboratories, drawing and boning, smoking and barbecuing, planning a turkey show, cooking turkeys, definitions and descriptions and miscellaneous data covering very useful information. And then to cap the climax a very fine 16 page index.

That is enough "talking turkey" about "Turkey Management." The best way to really understand the value of this book for turkey growers and others is to get a copy. (*W. D. Termohlen*)

The Chicken and the Egg. Wilson, William H. and Burks, Arthur J. Publisher—Coward-McCann Inc., New York, N. Y., 242 pages. 1955. Price $3.75.

This is not to be considered as a text book, though for many students it might be easier reading and more understandable than many texts. It is written informally and is the story of what goes on at a big Annual Chicken Barbecue at Lititz, Pennsylvania.

One learns about poultry at a barbecue and what goes in to raising the eggs and chickens which make the barbecue possible. You meet people from all over the United States and learn about their poultry practices.

Wilson is a poultryman, Burks is a Colonel in the Marine Corps Reserve and an eater of broilers and eggs. The authors started out to make the book simple and completely informative. They succeeded. It's the kind of book you could send to your city cousin, and he and his family would read it and probably eat more eggs and chickens. People in the poultry business could well afford to give a copy to the Home Economist of their local newspaper, radio or television station. (*W. D. Termohlen*)

Hygiene Der Haustiere, Wilhelm Nusshag. 530 pages, 356 illustrations. Published by S. Hirzel Verlag, Leipzig, Germany. (In German) Price DM 27.

This book is the first of two volumes dealing with the hygiene and diseases of domestic animals. In this volume the various factors which affect health are discussed. This is reflected in the chapters which include the following: The keeping of animals, history and task of hygiene, health and disease, inheritance, environment, light, meteorological conditions, climate and acclimatization, temperature, the earth, water supplies, sewage and its removal, manure, dead animal disposal, housing, pastures, house and pasture parasites, nutrition, work animals, hygiene in the dairy, care of animals, hygiene of reproduction, hygiene of poultry, hygiene in zoological gardens and in fur farming, hygiene of wild animals, care of hoofs, and animal health service.

The various subjects are treated in considerable detail, giving historical information, basic facts, composition and other data. Application is made to the various farm animals. Naturally more space is devoted to the larger farm animals. However, applications to poultry husbandry are discussed by Dr. Edward Gerriets, Berlin (about 30 pages in all). These include discussions on poultry keeping, poultry houses, parasite prophylaxis, feeding poultry and hygiene in the raising of poultry.

The longest chapter (about 85 pages) deals with the feeding of animals. In it are discussed the nutrients, including carbohydrates, fat, protein, organic and inorganic nutrients, composition of feeds, vitamins, feedstuffs, including green feeds, hay, roots and tubers, fermentation products, industrial residues, grains, straw, byproducts, animal products, preparation of feeds, feeding the various animals, harmful effects of feeds, poisonous feeds. (*G. F. Heuser*)

The Scientific Feeding of Chickens, Harry W. Titus. 297 pages. 1955 revised and enlarged edition. The Interstate, Printers and Publishers, Danville, Ill. $3.50.

The science of poultry nutition—feeding chickens—has advanced rapidly since the previous editions of this book appeared. Here the author brings you practical information on latest contributions. Many changes have been made in the text, additional material has been included and many of the feed formulas have been replaced by new ones of the type now in use.

Dr. Titus has brought together all the latest scientific data on poultry nutrition. Then through the use of many tables, graphs and discussions he has interpreted it so that it is of practical value to the poultryman, feed manufacturer, etc. He presents formulas for starting mashes, growing feeds, finishing feeds—and he shows their composition of proteins, fats, minerals, vitamins, etc.

The completeness with which the subject is discussed, the conciseness of the presentation and the understandable language used in the book make this a "must" for everyone concerned with poultry nutrition.

The scope of this book is indicated by the table of contents: Nutrients and their functions, Digestion and absorption, Metabolism, Hormones and nutrition, Utilization of feed, Nutrition and reproduction, Nutrient requirements and allowances, Quality of flesh and eggs as affected by diet, Nutritional diseases and vices, Nutritive properties of feedstuffs, Metabolic antagonists and incompatabilities in formula feeds, Individual feedstuffs, Management and feeding, Formulating diets, Useful information in formulating diets, Energy values of feedstuffs for poultry, Vitamin B_{12} and the unidentified growth factors, Feed additives, Hemorrhagic disease. (*G. F. Heuser*)

La Alimentacion en Avicultura, G. F. Heuser. Publisher—Union Tipografica Editorial Hispana Americana, Mexico, 1955. 607 pages. (Barcelona, Bogota, Buenos Aires, Caracas, Guatemala, La Habana, Lima, Montevideo, Quito, Rio de Janeiro, San Jose de Costa Rica, Santiago.)

This is a Spanish translation of Feeding Poultry, by G. F. Heuser, published by John Wiley and Sons, Inc., New York, N. Y. A review of the English edition appeared in the Library Section of the World's Poultry Science Journal, April-June, Vol. 11, 1955, p. 148.

REVIEW OF POULTRY PUBLICATIONS

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GENETICS

FARNSWORTH, GEORGE M. JR., and A. W. NORDSKOG. (Iowa State Coll., Ames.)
BREEDING FOR EGG QUALITY. 3. GENETIC DIFFERENCES IN SHELL CHARACTERISTICS AND OTHER EGG QUALITY FACTORS. *Poultry Sci. 34:* 16-26. 1955.—Measurements were taken on egg weight, shell color, shell texture, shell thickness, albumen height and yolk color on 2,520 eggs from several different lines and breeds of chickens over a 4-year period. Significant differences between breeds and lines within breeds were found for most of the traits studied. The repeatabilities (intra-class correlations) of line x year means over a 3-year period were: egg weight .49, shell color .63, shell thickness .42, shell texture .61, yolk color .63 and albumen height .34. Estimates of heritability (from full-sib correlations) were: egg weight .50, shell color .58, shell thickness .27, shell texture .27, yolk color .15, and albumen height .22. These estimates indicate that considerable improvement in egg weight, shell color, albumen height, shell thickness and shell texture is possible by mass selection. Repeatabilities of single egg measurements were: egg weight .57, shell color .64, shell thickness .37, shell texture .26, yolk color .37, and albumen height .42. These results indicate that from 5 to 10 eggs/hen are a sufficient number to sample these egg quality factors.—*Auth. summ.* (Biological Abstracts)

GLEICHAUF, R. (Bundesforschungsanstalt für Kleintierzucht, Celle)
HORMONE-TRIALS WITH COCKERELS AND PULLETS OF THE LEGBAR-BREED. *Archiv für Geflügelkunde. 19:* 369. 1955.—In order to elucidate the question if the barring pattern of the Legbars as a sex-linked factor is influenced by sexual hormones, six castrated cockerels were subjected to the effect of "Foragynol" for ten months. At the same time ten pullets were injected with the synthetic male sexual hormone "Testoviron-Depot Schering."—According to previous experiments the very contrasting male barring pattern of the treated cockerels did not show any change to female barring. The injection of Testoviron in pullets was without any effect.

GODFREY, GEORGE F., CLAYTON C. BRUNSON, and B. L. GOODMAN. (Oklahoma Agric. Expt. Sta., Stillwater.)
SECONDARY AND TERTIARY SEX RATIOS IN THE DOMESTIC FOWL. *Poultry Sci. 34:* 27-29. 1955.—The secondary and tertiary sex ratios of 4,970 Gold Oklabar, Silver Oklabar and "Smoky" White Rock chicks, all belonging to dam families in which all progeny were accounted for, were 51.97 and 51.91, respectively. From hatching until they were 9 or 10 weeks old, 174 males and 155 females died. These data do not support the sex-linked lethal theory which demands that heterogametic female shall be less viable than the male.—*G. F. Godfrey.* (Biological Abstracts)

MOREJOHN, G. VICTOR. (U. California, Davis.)
A HERITABLE CRIPPLING ANOMALY IN THE FOWL. *Poultry Sci. 34:* 64-67. Illus. 1955.—A crippling anomaly in the domestic fowl

is described which affects the pelvis, joints of the legs, and in some cases, the eyelids. The anomaly resembles other abnormal conditions in the fowl, such as, perosis, neurolymphomatosis, congenital perosis and curled toe paralysis. Genetic evidence is presented which demonstrates that this anomaly is inherited. Pelves of crippled and perosis-afflicted birds were compared and were found to resemble each other in their asymmetry. No significant deviation from normal was found in bone ash of cripples or perosis-afflicted birds.—*G. V. Morejohn.* (Biological Abstracts)

OSBORNE, ROBERT. (Poultry Res. Centre, Edinburgh.)
SEX-LINKED ASSOCIATION OF EGG WEIGHT AND BODY WEIGHT IN BROWN LEGHORNS. *Proc. Roy. Soc. Edinburgh 65B(21):* 317-326. 1954.—The present report is submitted as an illustration of the utility of variance and covariance analysis in the detection of specific modes of inheritance in quantitative genetics. The techniques are discussed with reference to the existence of sex-linkage, maternal effects, non-additivity, and the confounding of these. Comparison of variance components due to male and female parents has revealed marked evidence of sex-linked variation of egg weight in a population of Brown Leghorns, but no obviously associated variation of body weight. Subsequent analysis reveals large sex-linked covariance, and it appears that sex-linked variation of body weight is masked by non-additive effects. Similar conclusions follow from regression analysis of offspring on parent. For egg weight there is marked dependence of offspring on paternal variation, while for body weight, heritability from regression analysis is substantially lower than that estimated from correlations between offspring, in accordance with the existence of sex-linked and non-additive effects.—*Robert Osborne.* (Biological Abstracts)

OSBORNE, ROBERT. (Poultry Res. Centre, Edinburgh.)
SEXUAL MATURITY IN BROWN LEGHORNS, AND THE RELATIONSHIP OF GENETIC VARIANCE TO DIFFERENCES IN ENVIRONMENT. *Proc. Roy Soc. Edinburgh 65B(19):* 285-298. 1954.—The concept of heritability is discussed in relation to the climatic changes which may affect the variations of age at sexual maturity in the fowl, and it is suggested that genetic and environmental variance, as expressed in the customary statistical formulation, may be largely synonymous terms. Four groups of Brown Leghorn pullets are compared, 1 subject to no artificial lighting and the sub-optimal conditions of war years, a 2d to restricted lighting, and a 3d and 4th to 14-hour day length. The formal estimates of genetic and environmental variance were respectively, 910 and 978, 594 and 546, 188 and 295, and 56 and 135. Further reduction of variability is apparent on subdivision into early and late hatches, heritability being apparently zero in the 1st case but maintained at an average level in the 2d. Changes in variability substantiate the presence of genotype-environment interactions as previously reported, and similar conclusions follow from heterogeneity of regression of age at maturity on date of hatch.—*Robert Osborne.* (Biological Abstracts)

SCHMIDT, FRANCISZEK. 1954. (Universite Maria Curie-Sklodowska, Lublin, Poland.)
EXPERIMENTS ON THE INFLUENCE OF INBREEDING ON THE PERCENTAGE OF FERTILIZATION AND THE PERCENTAGE OF HATCH OF EGGS FROM HENS FED DIFFERENTLY THAN THE COCKS. *Annales Universitatis Mariae Curie-Sklodowska, Vol. IX, Sec. E.* pp. 133-149.—The aim of the experiments was to determine whether an influence is exerted on the percentage of fertilization and the percentage of hatch from fertile eggs. Two groups of hens were compared, one consisting of 8 hens related to the cock and the other involving 6 hens and a cock not related to the hens. The eggs of both groups were incubated and the percentage of fertilization was determined by candling and by breaking the eggs. The percent of hatch from fertile eggs was determined from the number of healthy chickens

hatched. Initially the cocks were fed on basic and the hens on physiologically acid food. Owing to technical difficulties this method has been changed during the course of the experiments and we only compared the percentage of fertile eggs and the percentage of hatch from fertile eggs in both groups of hens.

The observations were made in these series, in each of them different feeding was applied. During the first period the hens and the cock received the same food. During the second period the hens were fed on physiologically acid and the cock on physiologically basic food. In separate periods of the experiment the percentage of fertilization underwent characteristic changes, probably as a consequence of feeding, which points to a favourable influence exerted by different feeding of hens and cocks on the percentage of fertilization of eggs from related parents.

From the results obtained in these experiments we may infer that a negative influence on the percentage of hatch is exerted by inbreeding. As to the influence of inbreeding on the percentage of hatch from fertile eggs no certain inference has been arrived at, but the possibility of such influence cannot be entirely rejected.

SCHUMANN, H. (Institut für Tierzucht und Erbpathologie der Freien Universität Berlin.)

HEREDITARY ABNORMALITIES OF THE HEN'S BEAK. *Archiv für Geflügelkunde. 19:* 301. 1955.—A description of the hereditary abnormalities affecting the beak in fowl is given. The most effective measure against these unfavourable characters is the exclusion from breeding of the carriers of such genes.

VON FABER, H. (Zoolog. Institut der Landwirtsch. Hochschule Stuttgart-Hohenheim.)

ABNORMAL FEATHER STRUCTURE OF RHODE ISLAND RED PULLETS AND IT'S CAUSE. *Archiv für Geflügelkunde. 19:* 13. 1955.—A peculiar change in the structure of feathers of Rhode Island Red pullets is being described which corresponds with the changes after thyroidectomy. The histological examination of the thyroid gland and the feeding of thyroxine showed that the loosened structure of the feathers is not caused by an hereditary hypotrophy of the thyroid gland but that it is genetical caused.

WYATT, A. J. (Iowa State Coll., Ames.)

GENETIC VARIATION AND COVARIATION IN EGG PRODUCTION AND OTHER ECONOMIC TRAITS IN CHICKENS. *Poultry Sci. 33:* 1266-1274. 1954.—Heritabilities (h^2) and genetic correlations were computed from data on 1960 pullets representing 38 different lines of breeding. Traits studied were egg weight, winter egg production from Dec. 1-Mar. 1 (Pw), spring egg production from Mar. 1-May 31 (Ps), and body wt. (BW). Estimates of h^2 from regression of daughter on dam were .52, .11, .00, .40, .18, and .52 for egg wt., Pw, Ps, 8-wk. B.W., Housing BW, and Mar. BW, respectively. Corresponding estimates of h^2 from full-sib correlations were: .52, .41, .38, .46, .31, and .65, respectively. Estimates of genetic correlations between egg weight and Pw, and between Mar. BW and Pw were –.43 and –.31, respectively. These antagonistic genetic relationships along with low regression analysis estimates of h^2 for Pw and Ps may explain the apparently slow progress experienced in breeding for higher egg production.—*A. W. Nordskog.* (Biological Abstract)

PHYSIOLOGY

ALLEE, W. C., and DARHL FOREMAN. (U. Chicago.)

EFFECT OF AN ANDROGEN ON DOMINANCE AND SUBORDINANCE IN SIX COMMON BREEDS OF GALLUS GALLUS. *Physiol. Zool. 28(2):* 89-115. 1955.—One mg of testosterone propionate (Tp) was given daily to 25 hens of low social standing in single breed

flocks of 7 domestic breeds of chickens (Anconas, Rocks, Light Brahmas, New Hampshire (NH), Rhode Island Red (RIR), 2 strains of White leghorns). Fourteen of the hens injected showed social mobility in their home flocks, 9 did not, and 2 died. Among the 14 socially mobile hens reversals began earliest in Anconas and last in RIR. The 14 socially mobile hens won 60 reversals in social rank, 8 over androgen injected and 52 over non-injected flockmates. One of these hormone induced reversals (among Anconas) was nullified in the 6 months post regression period. Treated birds rose from lowest flock position to highest flock position in the Anconas, Rocks, Eberhardt leghorns, Brahmas and RIR. The hormone treatment produced the greatest effect on social mobility in the Anconas and Rocks, with RIR and Livengood leghorns showing the least change. The 37 non-treated hens showed only 5 reversals in the androgen treatment period. The effectiveness of added androgen was tested in staged paired contests. A series of 446 pre-androgen contests were compared with repeated contests between the same birds during androgen treatment. The androgen injected birds won only 1/3 of the pretreatment contests but after treatment they won 71% of the contests ($P = .001$). The Rocks were most successful in contests; the Brahmas least. Measured by the percent of change under the influence of androgen, the Brahmas were most successful, the Eberhardt leghorns least. The 7 treated hens that did not win higher social status in the home flock showed as much improvement in winning paired contests as did socially mobile Tp-treated flockmates. Two phases exist in the social effectiveness of Tp injections: (a) the increased ability to win paired contests on neutral territory, and (b) the increased ability to attain higher social status in the home flock despite the social inertia in the complex group organizations.—*Authors.* (Biological Abstracts)

BIGLAND, C. H., and F. E. GRAESSER. (Vet. Lab., Alberta Dept. Agr. Edmonton, Canada.)

CASE REPORT OF SEX REVERSAL IN A CHICKEN. *Canadian Jour. Comp. Med. and Vet. Sci. 19(2):* 50-52. 1955.—A white leghorn chicken about 18 months old was sent in with the information that it had been laying regularly but had ceased and now had begun to crow. The bird presented the picture of a male except for the tail plumage. The pubic bones which had originally been wide were now narrow. The ovary was tumefied and had 2 yellowish bodies attached, one the size of a hazel nut and the other that of a kernal of corn. The ovarian tissue was normal, ovarian follicles in various stages of development and regression were noted. The tumor was believed to be an arrhenoblastoma. It is assumed that it secreted sufficient male hormone to produce the sex reversal.—*R. Gwatkin.* (Biological Abstracts)

BROOKS, J. (U. Cambridge), **and H. P. HALE.**

STRENGTH OF THE SHELL OF THE HEN'S EGG. *Nature 175(4463):* 848-849. 1955.—Results of many different experiments are tabulated. The amount of pressure that can be sustained before cracking is proportional to both the thickness of the shell and the hardness of the outer layer, and there is a relation between strength, hardness, and Mg content, but many other factors are involved. The results do not prove that there is a direct connection between Mg content and the physical properties of the shell. (Biological Abstracts)

BUCKNER, G. DAVIS, W. M. INSKO, Jr., AMANDA H. HENRY, and ELIZABETH FAULL WACHS. (U. Kentucky, Lexington.)

A DISCUSSION OF THE ODOR AND TASTE OF THE OILY CONTENTS OF UROPYGEAL GLANDS OF CHICKENS BEFORE AND AFTER SEXUAL MATURITY. *Trans. Kentucky Acad. Sci. 15(4):* 117-120. 1954.—In mature chickens each lobe of the gland is approximately 5 x 5 x 3 mm and the oily content of each gland reaches the surface of the teat through 2 separate ducts, 1 mm apart. In some individuals the teat is bifurcated. The disagreeable taste and odor of the oily materials is intensified at sexual maturity. It varies in individuals, but not appreciably between sexes, and is not affected by types of feed

and forage ranges. The oily secretion contains glycerides of many organic acids and esters. The oils are not necessary for the health of the chicken nor the oiliness of the feathers. As the glands are absent or rudimentary in some chickens, it may be possible by breeding to develop strains of chickens that do not possess these undersirable features.—*R. H. Weaver.* (Biological Abstracts)

CHAMPION, LLOYD R. (Michigan State Coll., E. Lansing.)
A CASE OF PAIRED OVIDUCTS IN THE CHICKEN. *Poultry Sci. 34:* 184-186. Illus. 1955.—An adult female crossbred pullet hatched March 17, 1953 was found to have a right oviduct in addition to the normal left oviduct. Both the right and left oviducts had a respective orifice in one common vent opening. Age at sexual maturity was approximately 10 months. Egg production for 3 complete consecutive months plus 8 days was 10, 9, 7 and 2 eggs. Seven recorded egg weights and egg shell color ratings were within the generally accepted range of individual variability. Measurements in centimeters of the various regions of the left and right oviducts respectively, were: infundibulum, 5.0, 5.0; magnum, 36.5, 22.0; isthmus, 6.0, 4.5; uterus, 8.0, 5.5; vagina, 4.5, 4.5. Total lengths of the left and right oviducts were 60.0 and 41.5 cm, respectively. No extraneous materials in the form of cystic ovarian fragments or degenerating ova were present in the lumen of the right oviduct. However, physical attributes of the right oviduct were suggestive of functional activity.—*L. R. Champion.* (Biological Abstracts)

CLEGG, R. E., A. S. ROSENTHAL, and PAUL E. SANFORD. (Kansas State Coll., Manhattan.)
THE INFLUENCE OF CERTAIN SYNTHETIC ESTROGENS ON THE SERUM CALCIUM OF THE CHICKEN. *Poultry Sci. 33:* 1197-1198. 1954.—Of a number of compounds, all of which were reported to exhibit estrogenic activity only Estradiol cyclopentyl propionate (ECP) caused a rise in the serum Ca of chickens.—*R. E. Clegg.* (Biological Abstracts)

DAVIS, GEORGE T. (U. Wyoming, Laramie.)
INFLUENCE OF OXYGEN CONCENTRATION ON HATCHABILITY AND ON SELECTING FOR HATCHABILITY. *Poultry Sci. 34:* 107-113. 1955.—Supplementing the internal atmosphere of incubators with O_2 (in sufficient quantity to equal 19% at sea level) at high altitude (7200 ft.) resulted in increased hatchability in New Hampshire chicken eggs. Genetic improvement was more rapid in chickens hatched without supplementation because of the pressures of natural selection and higher selection accuracy. Genetic improvement was reflected in both atmospheres and not in acclimatization to the high altitude.—*G. T. Davis.* (Biological Abstracts)

GLUCHOWSKI, WITOLD. 1954. (Universite Marie Curie-Sklodowska, Lublin, Poland.)
A COMPARATIVE STUDY ON THE INFLUENCE EXERTED BY CHIRURGICAL AND BY HORMONAL CAPONIZATION ON THE MORPHOLOGY, GROWTH AND EFFICIENCY OF FEED UTILIZATION IN GREENLEG COCKS. *Annales Universitatis Mariae Curie-Sklodowska,* pp. 61-88.—From reports in literature it seems evident that estrogen treatment of short duration in poultry is of good use in practice since it increases the edible quality of birds. Long-continued estrogen treatment being of importance in our country the author endeavoured to compare the so-called "hormonal" caponizing with the well known surgical one.

The following characters were considered: exterior, behaviour, growth, feed utilization, weight of thyroids, testicles, right breast muscle, and haemoglobin percentage. The experimental birds were divided into three groups, namely 49 control cocks, 81 surgical capons, and 51 hormonized capons, all of the breed Polish Greenleg and reared under the same external conditions.

Into the base of the comb of the hormonized cocks 2 pills of 4.4'

diethylstilbestrol were introduced subcutaneously several times. (fig. 1)

The first part of the experiment lasted for 23 weeks. Since after the lapse of this time no significant differences had been stated with regard to important characters, growth and feed utilization of the same similarly treated cocks were studied during 6 weeks 7 months later. The results referring to growth during the whole period are grouped in Table 1. Tables 2 and 3 illustrate the data for the second experiment including feed utilization, mean haemoglobin percentage, weights of thyroids, testes and right breast muscle.

During the period of the entire experiment the exterior and behaviour of the control cocks were normal, whereas the surgical capons began to develop caponical characters as soon as during the second week and exhibited them unchanged until the end of experiments. In the estrogen treated cocks the size of combs decreased initially and the birds stopped crowing, but up from the 18th week of experiments the combs began to increase in size and the birds were crowing again; moreover, towards the end of the first experiment their sexual excitability was even more pronounced than in control cocks. At the same time, and very much in discordance with their comb size and behaviour, appeared changes in their feathering in the female direction. Analogous changes in colour and type of plumage, as well as changes of the remaining secondary sexual characters in the male direction, were more accentuated in the second part of the experiments.

Table 1 indicates that in the first experiment there were no particular differences in the growth of the experimental groups. Statistically proved differences in weight between surgical capons and the remaining groups, for the advantage of the capons, were observed in the second part of the experiments.

Table 2 shows that for 100 gms of weight gain, the smallest quantity of feed was utilized by surgical capons (27% less than by control cocks), which agrees with Szuman (29, 30) and with Csukas (10), while estrogenized cocks had the highest feed consumption (34% more than control cocks).

Haemoglobin percentage in surgical capons was considerably lower (10% in agreement with Csukas) than in control cocks, whereas in hormonized cocks it was higher (5%), yet the difference was not statistically proved (Table 3). The thyroids in treated cocks were 37% heavier than those of control cocks; for surgical capons the difference was only 6%. The testicles in hormonized cocks were 28% heavier than in control cocks. Consequently, the author has ascertained, that a prolonged estrogen treatment as applied to cocks results, on the one hand in hypermasculinity with regard to sexual instinct, testicle size and haemoglobin percentage, on the other—in marked differences in plumage of the female type.

In considering the results obtained in these experiments and those reported by literature the author comes to the following conclusions:

1. A long-continued estrogen treatment applied to cocks for production of full-grown birds at an economically reasonable cost, cannot be recommended for wider practice, because:
   a) it does not prolong the growth period, b) it raises feed consumption to 34% more per 100 gms of weight gain, c) it may affect people's health.
2. Surgical caponizing is well-founded under our conditions because:
   a) it lengthens the growth period, b) it allows producing superior quality meat, c) feed consumption for 100 gms of weight gain is 27% lower than in control cocks.
3. The results referring to physiological and morphological characters in surgical capons were concordant with the data reported by other authors.
4. In hormonizing cocks the author has ascertained—for the first time in so far as he knows—in contrast to what has been ascertained by other authors during treatment of short duration, that the weight of thyroids and testicles and the haemoglobin content were considerably increased by long continued estrogen application.

GREUEL, E. and F. KNAPPEN. (Forschungstation für Geflügelkrankheiten, Tierphysiologisches Institut der Universität Bonn.)
CORRELATIONS BETWEEN THE EXTINCTION OF THE SERUM AND THE INVOLUTION OF THE YOLK-SACKS OF CHICKENS DURING THE FIRST WEEKS OF LIFE. *Archiv für Geflügelkunde. 19:* 268. 1955.—The carotinoid levels of the blood and of the yolk-sacks were controlled and, simultanously, the weights of the chickens and their yolk-sacks were tested. The results of the experiments with chickens fed rations with and without carotinoids were the following: 1. The diminution of the serum extinction of the two groups seems to be caused by the involution of the yolk-sacks. 2. After the involution of the yolk-sacks there is still a considerable serum extinction which is kept by the store of carotinoids in the liver. 3. The feeding of carotinoids increases the level of the blood in spite of the sufficient supply from the yolk-sacks without stopping the diminution of their carotinoid levels. 4. The composition of the carotinoid mixture in the yolk-sacks as well as in the serum changes in the same manner during the first 6 days of the test. 5. The composition of the serum carotinoids differs from that of the yolk-sacks which, in opposition to the serum, is rich in carotinoids belonging to the group of hydrocarbons.

HERRICK, E. H., C. H. LOCKHART, E. P. MARTIN, and W. L. NUSSER. (Kansas State College, Manhattan.)
INFLUENCE OF SEX HORMONES ON BLOOD CELL COUNTS AND HEMOGLOBIN LEVELS IN FOWLS. *Trans. Kansas Acad. Sci. 57(4):* 483-492. Illus. 1954[1955].—Female fowls and capons had approximately the same erythrocyte counts, near 2,500,000. Male fowls had an erythrocyte count of about 3,500,000. Treating female fowls and capons with male sex hormone resulted in an increase in the RBC approximately to that of normal males but with a return to pre-injection levels after the injections were stopped. Treating capons with both testosterone propionate and diethylstilbestrol resulted in a rise in the RBC but to a somewhat lower level than with the male sex hormone alone. Male fowls treated with stilbestrol showed a drop in the RBC to about the same level as in females and capons. The RBC returned to the pre-injection level after treatment was discontinued. Female fowls had a leucocyte count of about 15,000. This increased to more than 19,000 after the birds were treated with male sex hormone. Capons had a WBC of about 10,000. This increased under the influence of male sex hormone but to a somewhat lower level than in female fowls, Male fowls treated with diethylstilbestrol showed a drop in the WBC but with a return to normal, after treatment was discontinued.—*Auth. summ.* (Biological Abstracts)

JUHN, MARY. (U. Maryland. College Park).
ON THE TWO-FOLD SOURCE OF PATTERN IN PLUMAGE IN THE FOWL, WITH EXAMPLES FROM THE HYBRID. *Jour. Exptl. Zool. 126:* 473-495. Illus. 1954.—The contributions to the feather color pattern of the fowl which are derived from the developmental properties of the regenerating feather, as distinct from the contributions of the melanophore, were examined. The fowl studied were F_1 males from matings of Barred Plymouth Rocks and Brown Leghorns, of Barred Plymouth Rocks and New Hampshires, and of Brown Leghorns and New Hampshires. The structure proper to the dorsal tracts appears in the ventral feathering if the secretions of the thyroid are interrupted. Conversely, the dorsal feathering takes on the structure of the ventral plumage when thyroxine is administered. In the Plymouth Rock barring is retained (although in highly altered widths) in either experimental alternative. The Brown Leghorn lays down the pigment which is associated with the structure corresponding to the modified in the normal. The Leghorn-like pigments of the F_1 behave as in the parent. The highly distinct configuration and sectional barring of the hybrid gradually disappear when feather growth is slowed under thiouracil; the regenerates then resemble the corresponding type of the Barred Plymouth Rock. This is a notably clear instance of the somatic participation. Sim-

ilar principles were apparent in the behavior of the barred plumage in crosses with the New Hampshire.*Auth.* (Courtesy Wistar Bibl. Serv.)

KAUFMAN, LAURA. 1954. (Universite Marie Curie-Sklodowska, Lublin, Poland.)

EXPERIMENTS ON SEX MODIFICATION IN COCKS DURING THEIR EMBRYONAL DEVELOPMENT. *Annales Universitatis Mariae Curie-Sklodowska*, Vol. IX, Sec. E, pp. 25-42.—The author endeavoured to solve the problem as to whether female metabolism and complete sex-reversal may be caused in birds by introducing oestrogens into the eggs during early development stages (prior to the formation of the sex glands).

Synthetic oestrogen, i.e., 1.5 mg of rutoestrol was introduced into the air-chamber of eggs after 24 or after 48 hours of incubation. A new simplified method has been applied. It consisted in removing a small piece of the shell by means of a sterile needle and after the dry oestrogen had been put in, covering the opening with an other somewhat larger piece of shell and fastening it with egg-white. The eggs derived from Sussex or from Rhode Island hens mated with Greenleg cocks. Female baby-chicks from these matings may be easily distinguished from male chicks by their dunn- and by their shank-colour (first mentioned mating* or by the shank-colour only (second cross).

After several preliminary experiments the hormone was introduced into 40 fertilized eggs, i.e., into 26 eggs of the mating Sussex ♂ x Greenleg ♀ and into 14 eggs of the latter cross. Chickens of the former cross were killed after 4 to 7 months, those of the latter cross—as soon as after 2 months of their life.

The sex-dimorphism of dunn and of shank-colour characteristic of the hybrids experimented upon was ascertained also in the chickens hatched from the hormonized eggs. On the other hand, in the birds with male feathering 5 months old the combs and the wattles were badly developed and pale. Two birds killed when seven months old had large combs. The body shape of all birds from hormonized eggs was similar to that of hens. The birds did neither crow nor exhibit any sex-instinct.

The male-feathered chickens from hormonized eggs were always heavier than the female feathered from such eggs of the same age and during the whole period of the observation (up to the 17th week after hatching) their average rate of growth was larger than that of the female chickens.

At the dissection of the male feathered birds from hormonized eggs first of all two very large oviducts were noticed. Their walls were as a rule thin and frail, in some cases they were filled with serous liquid and in three cases their mucous membrane was hypertrophied and the whole lumen of the oviduct was filled with tumerous tissue.

The sex glands of these birds were in younger specimens ovary-shaped (both or the left only), in birds seven months old they were multilobular, flat and very large.

Two oviducts with thin walls and pathological characters (filled with translucent fluid) were found in the pullets hatched from hormonized eggs.

Histological examination of the sex-glands of the cockerels revealed complete absence of spermatozoa even in a bird six months old and hypertrophy of interstitial tissue. No sign of ovogenesis could be ascertained.

From these experiments as well as from the literature referring to the same problem it may be inferred that great changes and first of all development of the Mullerian ducts and atrophy of seminiferous tubules are elicited by introducing female hormone into developing eggs. This does not mean either sex-inversion or hormonal castration, as the developmental disturbance caused by the experiments are followed by pathological changes (tumours of the oviduct).

The experiments reported here may be summarized as follows:

1) The introduction of cca 1.5 mg "rutoestrol" into the air-chamber of eggs after 24 hours and after 48 hours of incubation resp. is followed in the pullets hatched from "hormonized" eggs by the development of the two oviducts (the right incomplete), and in cockerels by the develop-

ment of the oviducts and by flattening of one (the left) or of the two testicles. On macroscopical examination the testicles are very like immature ovaries, a histological study reveals gradual atrophy of the seminiferous ducts and hypertrophy of interstitial tissue.

2) The oviducts in male chickens are anomalous, i.e. in very young their birds walls are thin and frail, in older specimens they are filled with serous fluid. In three cases hypertrophy of the epithelium of the mucous membrane and formation of tumerous tissue has been observed.

3) Sex dimorphism of feather colour, characteristic of the hybrids used in these experiments appeared equally in the birds hatched from hormonized eggs. The rate of growth of the birds with male feathering was larger than that of the female feathered specimens. The birds did not exhibit sex-instinct nor did they crow.

4) The introduction of "rutoestrol" into developing eggs is followed by disturbance of hormonal balance and by pathological changes in the sex glands and sex-ducts, especially in male birds.

KAUFMAN, LAURA, WITOLD GLUCHOWSKI and JOSEF ZIEBA. 1954. (Universite Marie Curie-Sklodowska, Lubl'n, Poland.)

ON THE INFLUENCE EXERTED BY ULTRAVIOLET RADIATION ON VIABILITY OF POULTRY. PART 1. IRRADIATING EGGS DURING INCUBATION. *Annales Universitatis Mariae Curie-Sklodowska* Vol. IX, Sec. E, pp. 49-60.—Eggs of hens (♀ Leghorn x ♂ Greenleg, ♀ Sussex x ♂ Greenleg, Greenlegs, Sussex, Polbar, Polish Gold) as well as ducks' eggs were irradiated 5 minutes daily by means of a medical quartz lamp (4000-2500 A) or by means of an analytical lamp with filter (4000-3000 A) during the following periods of incubation: 1) the first 6 days, 2) the first 9 days or 3) from the 9th until the 18th day of incubation.

The results of these experiments as to the effect of ultraviolet irradiation of eggs on their hatchability are in agreement with those reported by Fronda and Belo, who exposed developing eggs to sunlight and with those obtained by Cholevcuk by using a quartz lamp.

1) Irradiation of hens' and ducks' eggs during the first 6 days of incubation had a favorable influence on hatching results. The percentages of hatch were (one case excepted) higher in the groups of eggs experimented upon than in those used as a control (table 1 & 2).

2) Analogical results were noticed when acting by ultraviolet radiation during the first 9 days (table 3).

3) On the contrary, no influence of ultraviolet light was ascertained, when it was applied between the 9th and the 18th day of incubation (table 4). The reaction to ultraviolet radiation consequently depends on the developmental stage during which the stimulus has been applied.

4) The shells of irradiated eggs contained after the hatch less inorganic matter than the same surface of shells of the control group of eggs. This points to a better assimilation of mineral salts (Ca) by the embryos in the eggs experimented upon (table 5).

KAUFMAN, LAURA and BARBARA ONOSZKIEWICZ. 1954. (Universitate Marie Curie-Sklodowska, Lublin, Poland.)

ON THE INFLUENCE EXERTED BY ULTRAVIOLET RADIATION ON VIABILITY OF POULTRY. GROWTH OF DUCKLINGS FROM IRRADIATED EGGS. *Annales Universitatis Mariae Curie-Sklodowska*, Vol. IX, Sec. E, pp. 89-101.—Eggs of Pekinese ducks were irradiated 5 minutes daily by means of an analytical lamp (1952) or by a medical quartz lamp (1953) during the first 6 days of incubation. The favourable influence exerted by ultraviolet irradiation on hatching results has been reported in a former paper (Annales UMCS, Sec. E, Vol. IX, 4). In continuation of the experiments the growth of the ducklings hatched from irradiated eggs was compared with that of birds of the control group. The following conclusions may be drawn from this research (Table I-V):

1. The weight of 8, 9 and 10 weeks old drakes and ducks hatched from irradiated eggs was higher than the weight of birds of the same sex and age from the eggs used as a control. Biometrically essential differences were ascertained for drakes 8, 9 or 10 weeks old in 1952

and for ducks 10 weeks old in 1953.

2. During the first period of postembryonal life the percent rate of growth was higher in the experimental group (until the 4th week during the first and till the 2nd week during the second year of experiments.) The weight of newly hatched ducklings of the experimental group, expressed in percentages of egg-weight was lower than in the control group. This points to increased rate of growth of embryos in the eggs which had been irradiated. The same follows also from the date of hatch which was half a day earlier from the eggs of the experimental group.

KODINEC, G., and E. KOVACS. 1955.

MATING METHOD OF TURKEYS. (A PULYKAK PAROSITASI MODJA) *Agrartudomany.* Budapest. 4 pp. 167-168.—In the interest of taking up turkey breeding on a larger scale, it is desirable first to solve the question of making better use of the cocks by realizing the superfluous cocks and to reduce the number of injuries caused through mating.

According to experiences cocks kept together with hens during the breeding time often cause injuries to the latter with their spurs. The application of the so far recommended methods did not lead to adequate results regarding the avoidance of injuries. Experiences of small breeders prove that the eggs of hens mated once only remain fertile for a longer time. Literature also reports about similar observations.

In order to study this question authors made experiments with 7 hens at the Poultry Department of the Research Institute for Small Animals, Godollo, with the main object of establishing the maximal time while eggs remain fertile after one mating.

The hens were kept separate from the cocks and every hen was paired once only. According to the establishments of the authors the eggs remained fertile for 56 days. The whole stock of the farm, the cocks of which were constantly kept among the hens, was considered as a control group. The comparison showed that although the fertility in the stock was better the hatching rate was less favourable due to the reduced viability of the sperm. Besides this the number of injuries caused in the course of mating was considerable, so that during the hatching season, on account of this fact, 18% of the stock hens had to be emergency slaughtered and 29% were culled. It is proposed that the hens be paired only every third week and not daily as this is now customary. (Hungarian Agricultural Review)

KORNFELD, WALTER, and ANDREW V. NALBANDOV. (U. Illinois, Urbana.)

ENDOCRINE INFLUENCES ON THE DEVELOPMENT OF THE RUDIMENTARY GONAD OF FOWL. *Endocrinology 55:* 751-761. 1954.—Growth of the rudimentary right gonad of ovariectomized, domestic fowl can be inhibited with exogenous estrogen and, to a lesser extent, with androgen. It is possible to prevent the hypertrophy of the rudiment even with a quantity of estrogen that has no significant effect upon oviduct weight and which apparently lies below the estrogen threshold for oviduct stimulation. Estrogenic substance was demonstrated in the blood of young chicks. The adequacy of a "physiological" dose of estrogen coupled with the demonstration of its presence at an age of sexual "inactivity," lends strong support to the contention that estrogen is involved in the in vivo mechanism of rudiment inhibition. Following ovariectomy the sensitivity of the compensatory right gonad decreases with time, i.e., estrogen dosages increased in proportion to body weight lose their effectiveness. This observation helps to explain that compensatory gonads can, and ultimately do secrete considerable amounts of estrogen. Prolactin depresses rudiment hypertrophy in ovariectomized birds. The mode of action of prolactin, known to antagonistic to that of follicle stimulating hormone might be analogous in effect at least, to the mechanism of rudiment inhibition by estrogen. Hypophysectomy significantly depresses the weight of hypertrophied testicular rudiments as well as their androgen secretion. All attempts to accelerate the growth of compensatory gonads, or to maintain them in hypophysectomized poulards with mammalian gonadotropic hormones have failed.—*Authors.* (Biological Abstracts)

KRASEWSKA-DOMANSKA, BOHDANA. 1954. (Universitate Marie Curie-Sklodowska, Lublin, Poland.)
RESEARCH ON THE CORRELATION BETWEEN THE WEIGHT OF EGGS AND THE WEIGHT OF CHICKENS HATCHED THEREFROM. *Annales Universitatis Mariae Curie-Sklodowska,* Vol. IX, Sec. E, pp. 151-162.—The aim of the present research is to solve the problem of the correlation between the weight of eggs and the weight of full-grown chickens hatched from them. In the case of an essential positive correlation between these two values an improvement of body-weight in fowls could be obtained by selecting hatching eggs of adequate weight. This problem is especially important in application to the Greenleg breed, the body-weight of which ought to be improved.

The author examined the correlation between the weight of 161 eggs and that of 7 days old and of full-grown birds hatched therefrom. Tested were the Polish Greenleg fowls derived from three consecutive hatches, on March 9, March 22, and April 6, 1949.

In preliminary computations an essential difference between the weights of 7 days old and of 5 months old cockerels and analogous weights of pullets was ascertained. An analogous difference was found as to the weights of the chickens from the 1st and 2nd and of those from the 3rd hatch, whereas no biometrical differences existed between the weights of the birds from the two first hatches. (Tables 1, 2 and 3) Consequently, the correlations between egg-weight and body-weight were computed separately for each sex and for birds from the 3rd hatch and together for those from hatch 1st and 2nd.

The results of these studies may be summarized as follows:

1. No correlation was found between the weights of 7 days old or of 5 months old chicks and the weights of the eggs from which they hatched.

2. No correlation could be ascertained between the mean yearly egg-weight of hens and the weights of their progeny 5 months old.

3. So far as Greenlegs are concerned, egg-weight cannot be considred as a basis for selection as regards the body-weight in fowls.

LORINC, F. 1954.
EXAMINATION OF THE SUPPOSED CONNECTION BETWEEN THE FATTENING ABILITY AND THE FUNCTION OF THE SUPRARENAL GLANDS OF DOMESTIC GEESE. (A HAZILUD HIZEKONYSAGA ES A MELLEKVESE MUKODESE KOZOTT FELTETELEZETT OSSZEFUGGESEK VIZSGALATA.) *Agrartudomany,* Budapest. 11. pp. 332-337.—According to a reference made the dosing of ammonium chloride (NH_4CL) has a stimulating effect on the function of the anterior pituitary of domestic geese which in turn causes hypertrophy and increased function of the cortical substances of the suprarenal glands and this furthers better food utilization. Therefore, author made intensive examinations of the suprarenal glands of geese. He worked up the suprarenal glands of 41 geese treated with ammonium chloride and those of 30 control geese. Besides, the suprarenal glands of 412 geese deriving from various parts of the country were also examined.

He established following:

1. There is a direct proportion between the weight of suprarenal glands and the body weight of geese.

2. The average weight of the right and left suprarenal glands of 6-8 months old geese is between 0.5-1 g, the weight of suprarenal glands of ganders is generally heavier.

3. Dosing of ammonium chloride caused neither growth of the suprarenal glands, nor histologically proved hypertrophy of the substancia corticalis.

4. Dosing of ammonium chloride did not improve the weight increase of fattening geese, i.e., the fattening ability. (Hungarian Agricultural Review)

MARTIN, JOHN E., JOHN H. GRAVES, and F. C. DOHAN. (U. Pennsylvania, Sch. Vet. Med. and Sch. Med., Philadelphia.)
LOCAL INHIBITION BY ESTRONE OF TESTOSTERONE-

INDUCED GROWTH OF THE CAPON'S COMB. *Amer. Jour. Vet. Res. 16(58):* 141-146. 1955.—Combs of White Leghorn capons were surgically separated into 2 half-combs. A daily dose of 2 μg of testosterone propionate was applied to both half-combs and simultaneous applications of various doses of estrone were made to one. The steroids were applied for 5 days. Half-combs treated with estrone in daily doses of 100 or 200 μg, but not with 80 or 160 μg, grew significantly less than their paired controls receiving only testosterone propionate. Histological development of the cockerel-type comb occurred in half-combs receiving only testosterone propionate, but the development was markedly depressed in the corresponding half-comb treated with the estrone-testosterone propionate mixture. It is concluded that, under conditions of this experiment, estrone acted by antagonizing the action of testosterone propionate at the target tissue level. Relative proportions of hormones present may be an important feature in determining the type of response to the mixture.—*Authors.* (Biological Abstracts)

OLSEN, M. W. and S. J. MARSDEN. (Agric. Res. Serv., USDA, Beltsville, Md.)

MORTALITY AMONG TURKEY EMBRYOS IN RELATION TO RATE OF EMBRYONIC DEVELOPMENT. *Poultry Sci. 33:* 1146-1151. 1954.—Beltsville Small White turkey eggs were candled at 24, 32, 48 and 72 hours of incubation. On each occasion of candling, eggs showing embryonic development were segregated and incubated separately in groups during the remaining period of incubation. Eggs showing no embryonic development on the previous candling were given further incubation and then recandled. This candling process was repeated at 32, 48 and 72 hours of incubation, each time candling only eggs that had appeared "clear" previously. Eggs in which no embryo could be detected by candling by 72 hours of incubation were assumed to be infertile and so classified. Eggs in which embryos were visible at 24 hours of incubation gave an average hatchability of 79.4% of fertile eggs whereas eggs in which embryos become visible at 32, 48 and 72 hours of incubation gave average hatchabilities of 33.3, 27.7 and 8.1% of fertile eggs, respectively. Among 675 eggs which appeared clear before the candler at 72 hours of incubation 151 or 18.2% upon further incubation developed embryonic tissue, but without embryos. It is suggested that this latter group possibly may represent infertile turkey eggs which developed parthenogenetically.—*Auth. summ.* (Biological Abstracts)

SKALSKA-SURDACKA, KRYSTYNA. 1954. (Universite Maria Curie-Sklodowska, Lublin, Poland.)

THE INFLUENCE OF THE HATCHING TIME UPON MATURITY, EGG-LAYING RATE AND WINTER EGG-PRODUCTION IN POLISH GREENLEGS AND RHODE ISLAND REDS. *Annales Universitatis Mariae Curie-Sklodowska,* Vol. IX, Sec. E, pp. 209-228.—The object of this study was to determine the influence exerted by the date of hatching upon maturity, laying rate and winter egg production in Polish Greenlegs and Rhode Island Reds reared under the same conditions.

The numeral material derived from control registers of egg-laying conducted for the years 1936-1939 at the Breeding Station "Julin" near Warsaw, consisted of 440 Polish Greenlegs and 511 Rhode Island Reds.

The Polish Greenlegs were hatched from February 25th to May 16th and the Rhode Island Reds from January 1st to April 22nd.

The results arrived at lead to following conclusions:

1. In Polish Greenlegs a distinctly positive correlation between the hatching date and the length of the maturing period occurred in one year only out of the 3 years tested.

In Rhode Island Reds the positive correlation occurred in all the years.

2. The positive correlation between the hatching period and the rate of winter laying occurred in the Greenlegs in two years only (in one year it could not be ascertained); in Rhode Island Reds in all the cases.

3. The average number of days until maturity, computed over the 3-year period, was in Polish Greenlegs from 209.3-227 days, in relation to the time of hatching, and in Rhode Island Reds reared under the same external conditions—from 200.7 to 226 days.

4. The mean laying rate in the tested period ranged in Greenlegs from 39.3 to 44.1%, in dependence on the hatching time, and in Rhode Island Reds from 48.7 to 53.8%.

5. Winter egg-production in Polish Greenlegs averaged 62.8-32.2 eggs, and in Rhode Island Reds—87.3-53.8 eggs. Winter egg-production depended strictly on the time of hatching.

6. The results of the present investigations show that the highest rate of egg-production in winter, characteristic of the annual production capacity, occurs in Polish Greenlegs which were hatched from March 17th to April 29th. Pullets hatched during this period matured on the average after 225 days, their rate winter production amounted to 44.7 and the winter yield averaged 43.4 eggs. Rhode Island Reds had the best rate of laying when hatched from March 10th to April 2nd. These pullets were characterized by attaining maturity after 228.3 days, by an equalled laying rate of 55.7, and winter productivity of 62.4 eggs.

STAMLER, J. (Med. Res. Inst., Michael Reese Hosp., Chicago.)
ESTROGEN INHIBITION OF CORTICOID HYPERTENSION IN CHICKENS. *Circulation 10:* 896-899. 1954.—Estrogens tend to lower blood pressure of cockerels. Both estrogen-treated cockerels and estrogen-secreting hens are specifically protected against hypertension induced by desoxycorticosterone acetate, desoxycorticosterone acetate plus NaCl, and cortisone. Mature egg-laying hens exhibit low K levels. Estrogen inhibition of corticoid hypertension is associated in both cockerels and hens with decreased concentrations of plasma K.—*J. Stamler.* (Biological Abstracts)

TOTH, P. and J. BOGRE. 1955.
THE DEVELOPMENT OF HEN EMBRYOS. (A TYUKEMBRYO FEJLODESE). *Agrartudomany.* Budapest. 3. pp. 132-135.—Hatching results can be still considerably improved if besides the appliance of up-to-date technical methods also the biological control of hatching is realized. This system endeavours to establish the poor quality of the eggs used for hatching, as well as the faults ensuing during hatching by the abnormalities detectable in the development of the embryo. The biological control preciously completes the use of physical measuring instruments. The biological control cannot be performed in a simple prescription like manner, various observations must be made and from these the conclusions collected.

Besides the exterior judgment and the transillumination of eggs before hatching it is advisable to make a germinal-disc examination in the first 24-36 hours of hatching already which it is necessary to repeat by further three trans-illuminations, on the 6th, 11th and 19th day of hatching. The hatching intensity and energy must be established by the time between the breaking up of eggs and the chicks creeping out of them, resp. the time elapsed between the first and the last chick coming out. Finally after hatching the day-old-chicks must also be judged. It is useful too to prepare a mortality curve which will show the rate, resp. the extent of deaths during the whole hatching time.

The faults arising in the course of hatching can also be subsequently established based on the abnormal development or changes of the embryo. For this purpose the embryos must generally be dissected and then examined, for which authors give practical advices. Besides, they report about the consequences resulting from the deficient protein, mineral material and vitamin supply of the stock which manifest themselves in various symptoms of the irregular development of embryos. (Hungarian Agricultural Review)

TULLNER, WILLIAM, ROY HERTZ, and EDWARD RAFFELT. (Natl. Cancer Inst., Bethesda, Md.)
A COMPARISON OF THE BIOLOGICAL ACTION OF ALLO-PREGNANE-21-OL-3, 21-DIONE ACETATE AND PROGESTERONE.

Endocrinology 55: 762-767. Illus. 1954.—A comparison of allopregnane-21-ol-3-, 20-dione acetate with progesterone on the basis of the well-known actions of the latter compound in (a) inhibiting the estrogen-induced growth of the chick oviduct, (b) progestational activity in the rabbit uterus, (c) deciduoma formation in the rat uterus, (d) suppression of pituitary gonadotropin in parabiotic rats and (e) prevention of withdrawal bleeding in estrogen-primed castrate female monkeys, has demonstrated that inhibition of chick oviduct growth is the only action common to the 2 steroids. Moreover, allopregnane-21-ol-3, 20-dione acetate was found to be 2-4 times as potent as progesterone in the oviduct assay. Thus, inhibition of the oviduct in the estrogen-treated chick may be clearly dissociated from other biological actions of progesterone. —*Authors.* (Biological Abstracts)

WHITMORE, G. E., and M. W. OLSON. (Amer. and Poult. Husb. Res. Br., Agric. Res. Center, Beltsville, Md.)

VASECTOMY OF TURKEYS. *Jour. Amer. Vet. Med. Assoc. 125-(931):* 286. 1954.—Through a 4″ transverse incision between the posterior end of the sternum and the anus, the vas deferentia were located and a 4 cm segment removed to sterilize turkeys.—*J. F. Ryff.* (Biological Abstracts)

NUTRITION

ABBOTT, O. J., H. R. BIRD, and W. W. CRAVENS. (U. Wisconsin, Madison.)

EFFECTS OF DIETARY ARSANILIC ACID ON CHICKS. *Poultry Sci. 33:* 1245-1253. Illus. 1954.—Stimulation of growth of chicks similar to that obtained with the antibiotic, penicillin, was obtained with arsanilic acid under various experimental conditions. In one series of experiments conducted with practical rations in one particular environment and extending over a period of about 1 year, the growth response to arsanilic acid and to penicillin diminished and disappeared concurrently. In another series of experiments in which a purified ration was employed the dietary thiamine requirement was spared by both arsanilic acid and penicillin. Arsanilic acid at a level of 500 mgs/g of ration did not suppress growth and did not produce any other evidence of toxicity. The lowest level which did slightly suppress growth was 1,000 mgs/g of ration, a level which is more than 10 times that permitted by the Food and Drug Administration for use in commercial feeds.—*O. J. Abbott.* (Biological Abstracts)

ACKERSON, C. W., and F. E. MUSSEHL. (U. Nebraska, Lincoln.)

THE UTILIZATION OF FOOD ELEMENTS BY GROWING CHICKS. 15. THE SUBSTITUTION OF KOREAN LESPEDEZA SEED FOR SOYBEAN OIL MEAL IN CHICK RATIONS. *Poultry Sci. 33:* 1228-1229. 1954.—Three lots of day old chicks were fed 0, 10 and 20% of ground lespedeza seed as a replacement for soybean oil meal. There were no differences in the average weights of the lots at 5 weeks. Ground lespedeza seed may replace soybean oil meal up to 20% of the diet.—*H. Branion.* (Biological Abstracts)

ALMQUIST, H. J., and STANLEY MAURER. (The Grange Co., Modesto, Calif.)

THE EFFECT OF ANTIBIOTIC, ANTIOXIDANT, AND FAT ON CONVERSION OF CAROTENE TO VITAMIN A IN THE CHICKEN. *Arch. Biochem. and Biophys. 55:* 297-298. 1955.—Conversion of carotene to vitamin A in the 8 and 10 week old chicks, as indicated by liver storage, was increased when antibiotics were present in the diet, and also when fat was added to the diet. An antioxidant in the diet had little or no effect.—*Authors.* (Biological Abstracts)

ARSCOTT, G. H., G. B. SWEET, and G. F. COMBS. (U. Maryland, College Park.)
EFFECT OF IODINATED CASEIN IN A SIMPLIFIED OAT DIET ON HATCHABILITY OF CHICKEN EGGS. *Poultry Sci. 33:* 1283-1286. 1954.—Four groups, of 33 New Hampshire pullets each, were fed experimental breeder diets containing 93.5% ground oat groats plus vitamins, minerals, feeding oil and DL-methionine. Despite the simplified nature of this diet, the hatchability of fertile eggs was maintained at an essentially normal level throughout the 32-week experimental period. Addition of 50 g of iodinated casein (Protamone) /lb. of feed during the last 8 weeks of the experiment resulted in a marked decrease in the hatchability of fertile eggs. This marked reduction in hatchability which accompanied the feeding of iodinated casein appears to have been caused by depleting the pullet of an unidentified hatchability factor. —*G. F. Combs.* (Biological Abstracts)

BIELY, J., B. E. MARCH, and D. A. SILVESTRINI. (U. Brit. Columbia, Vancouver, Canada.)
FAT STUDIES IN POULTRY. 1. HERRING OIL, SANTOMERSE-80 AND THYROPROTEIN IN THE LAYING RATION. *Poultry Sci. 33:* 1130-1135. 1954.—Addition of 6% herring oil to a practical type laying ration resulted in higher body weight, but had no effect on rate of egg production in White Leghorn pullets. Iodinated casein in a normal ration resulted in lowered weights, but this effect was counteracted to a large extent by feeding 6% herring oil. Supplementation with Santomerse-80 resulted in better feed efficiency.—*J. Biely.* (Biological Abstracts)

BIELY, J., and B. MARCH. (U. Brit. Columbia, Vancouver, Canada.)
FAT STUDIES IN POULTRY. 2. FAT SUPPLEMENTS IN CHICK AND POULT RATIONS. *Poultry Sci. 33:* 1220-1227. 1954.—Faster growth to 7 weeks of age with New Hampshire chicks, and to 10 weeks of age with Beltsville Small White and Broad Brested Bronze poults, was obtained by adding fat to rations containing high levels of protein. In rations in which the energy content was raised by the addition of fat, the level of protein which might be utilized efficiently was higher than in rations of lower energy content.—*J. Biely.* (Biological Abstracts)

CARVER, D. S., E. E. RICE, R. E. GRAY, and P. E. MONE. (Swift and Company, Chicago.)
THE EFFECT OF NO. 2 TALLOW IN POULTRY RATIONS ON THE FLAVOR OF FRESH AND STORED EGGS. *Poultry Sci. 34:* 131-132. 1955.—It is known that the flavor of eggs may be affected by certain materials which the hen may consume. To determine whether the use of a low grade fat possessing a dark color and a strong odor, in feeds for laying hens, would adversely affect the flavor of the eggs, No. 2 tallow was fed at a level of 3% in an all-mash type laying ration. No adverse effect was found on the flavor of the eggs produced either when fresh or when stored for periods up to 2 months.—*Auth. summ.* (Biological Abstracts)

COUCH, J. R. (Texas A. and M. Coll., College Station.)
ENVIRONMENT AND THE RESPONSE TO UNIDENTIFIED GROWTH FACTORS. *Feedstuffs 26(51):* 16-18. 1954.—The diet of the hen affects the amount of carryover of both the "whey factor" and "fish factor" in the chick hatched from her eggs, and consequently, the response of the chick to these factors. There is a greater response to unidentified growth factors when chicks are maintained in an "old environment" with a "high disease level."—*H. L. Wilcke.* (Biological Abstracts)

COUCH, J. R., WAN YUIN CHANG, and CARL M. LYMAN. (Texas A. and M. Coll. System, College Station.)
THE EFFECT OF FREE GOSSYPOL ON CHICK GROWTH. *Poultry Sci. 34:* 178-183. 1955.—No detrimental effect on chick growth

was observed when the free gossypol content of the diet was 0.06% or less. The growth rate of the chicks was progressively decreased as the free gossypol content of the diet was increased above 0.06% The addition of DL-lysine to the diet did not change the tolerance level of chicks for free gossypol. In a previous study it was found that samples of cottonseed meal of low protein quality were also low in lysine availability and that the protein quality of the meal was definitely related to lysine availablity. It might be postulated from these findings that a reaction between gossypol and lysine is also part of the mechanism of gossypol toxicity. However, the growth rate and toxicity symptoms were not found to be related to the lysine content of the diet. There was an improvement in growth rate upon the supplementation of lysine to the diet at all levels of gossypol tested. A Bauer Mill (Springfield, Illinois) was used for the liberation of pigment glands from the cottonseed meal and light mineral oil was used in place of hexane as a solvent. From the results of these studies it is evident that the free gossypol content of the cottonseed meal would have to be as much as 0.15% in order for the ration to contain a sufficient amount of free gossypol to exceed the 0.06% toxic level, using cottonseed meal as a sole source of protein. However, the problem of the lysine availability would necessarily limit the use of cottonseed meal to this extent.—*W. Y. Chang.* (Biological Abstracts)

CURTIN, L. V. (Buckeye Cotton Oil Co., Cincinnati.)

USE OF LOW GOSSYPOL COTTONSEED MEALS IN SWINE AND POULTRY FEEDS. *Feedstuffs 26(48):* 49, 56-62, 66. 1954.—There are 2 commercial methods by which low free gossypol (approximately .04% or less) may be produced at this time. These are: (1) the prepress solvent extraction method in which free gossypol reduction occurs primarily as a result of heating, both in cooking and in pressure, and (2) a chemical method. The latter method is used by Buckeye, an amine being used to react with the free gossypol. Cottonseed meals with .04% or less of free gossypol, and with a minimum N solubility index of 75%, may be used to replace at least 50% of the soybean oil meal in balanced rations for broilers, poults, or swine. Degossypolized cottonseed meals may be used to replace even higher levels (up to 80%) of the soybean oilmeal in broiler and poult rations.—*H. L. Wilcke.* (Biological Abstracts)

DELAFONTAINE, P.

SEROLAC—A BY-PRODUCT OF THE FRENCH DAIRY INDUSTRY IN CHICK RATION. Association Scientifique du B.N.A. 81a, rue Sylvabelle—Marseille, France. Report G 164, May 1955. (Report in French.)—Considerable amounts of lactalbumin, dried whey and dried skimmilk mixtures are now available for feed manufacturers in France. A complete analysis of Serolac is given, showing its use in high efficiency chick rations. The author gives numerous examples of feed formulas with a Serolac base. (In an effort to make this report common knowledge the B.N.A. Association will be glad to lend it, provided it is returned in good condition within 45 days.)

DOW, DOROTHY S., and C. E. ALLEN. (Sci. Serv., Canada Dept. Agric., Ottawa.)

RAPESEED OIL MEAL IN BROILER RATIONS WITH OBSERVATIONS ON THE NATURE AND CONTROL OF ITS METABOLIC INHIBITORS. *Canadian Jour. Agric. Sci. 34: 6*07-613. 1954.—Substitution of 17% rapeseed oil meal for the soybean oil meal component of a broiler ration produced birds of equivalent weight and quality at 12 weeks to those on the control diet. The inclusion of iodide at a level of 3 ppm (calculated as I) controlled the goitrogenic and anti-thyroid effects of the rapeseed meal. The criteria of response were body weight, skeletal growth, carcass quality, feed efficiency, thyroid gland histology and metabolic rate (as indicated by plasma protein-bound I values). No detrimental effects of feeding rapeseed meal were observed during 3 trials. Because iodide inhibited both the goitrognic and anti-thyroid effects, it is suggested that the goitrogenic principle involved is a thio-

cyanate rather than a thiocarbamide substance.—*D. S. Dow.* (Biological Abstracts)

FANGAUF, R., F. W. KLEIN, and G. v. BARLÖWEN. (Lehr- und Versuchsanstalt für Kleintierzucht, Kiel-Steenbek.)
RUSH MEAL IN THE RATIONS OF CHICKENS. *Archiv für Geflügelkunde. 19:* 374. 1955.—In a chicken raising experiment with New Hampshires alfalfa meal was substituted by 3% and 6% of rush meal (Scirpus lucustris L.). It has been found that alfalfa meal can be substituted by rush meal. The amount of the latter one in the ration should, however, not be higher than 4%; an addition of 6% caused a growth inhibition.

FANGAUF, R., F. W. KLEIN, and G. v. BARLÖWEN. (Lehr- und Versuchsanstalt für Kleintierzucht, Kiel-Steenbek.)
THE LEVEL OF PROTEIN IN THE REARING DIET FOR CHICKENS. *Archiv für Geflügelkunde. 19:* 358. 1955.—In an experiment with 20 groups of 30 New Hampshire chickens each, always 4 groups received a feed containing 14%, 16% 18%, 20% and 22% of crude protein respectively. In 5 groups the protein was supplied by cod-fish meal, in 5 further groups 2/3 was supplied by cod-fish meal and 1/3 by soybean oil meal, ½ by cod-fish meal and ½ by soybean oil meal, 1/3 by cod-fish meal and 2/3 by soybean oil meal respectively. 1. The feed consumption did not show any differences when feeding different amounts of animal and vegetable protein. It was increased, however, with an increasing amount of crude protein, i.e. up to 20% of crude protein. 2. The rate of gain was independent from the kind of the products supplying the protein. It was, however, increased with an increased amount of crude protein up to 20%. At 22% of protein the rate of gain was reduced. 3. The feed utilization was most favourable when only animal protein was fed and was reduced with an increased amount of soybean oil meal. 4. The feed consumption per 1 kg gain was not influenced by the different amounts of animal and vegetable protein fed, however, it was increased with an increased amount of crude protein in the feed. 5. The results of this experiment recommend for practical use a feed containing 16% of crude protein for rearing of laying and breeding hens and a feed containing 20% of crude protein for the growing-fattening period.

FANGAUF, R., F. W. KLEIN, and G. v. BARLÖWEN. (Lehr- und Versuchsanstalt für Kleintierzucht, Kiel-Steenbek.)
THE INFLUENCE OF PELLETING AND STORING OF FEEDS ON THE EFFICIENCY OF DIFFERENT SUPPLEMENTS OF VITAMINES. *Archiv für Geflügelkunde. 19:* 239. 1955.—24 groups with 30 New Hampshire day-old chickens each were fed for 8 weeks to compare feed as meal and as pellets, fresh and being stored for 8 weeks. To some of the feeds vitamines were added, others contained no additional vitamines. A storage of the meal feed or pellet feed for 8 weeks had no effect on the feed consumption and rate of gain of the chickens in comparison to feed of the same kind, but fresh. The efficiency of the added vitamines was neither decreased by the pelleting nor the storage. Natural vitamines could be substituted by synthetic vitamines without any detrimental effect. The pelleting of the feed caused an increased feed consumption, increased rate of gain and better feed efficiency. The addition of vitamines caused an increased rate of gain and a reduction in mortality.

FANGAUF, R., F. W. KLEIN, and G. v. BARLÖWEN. (Lehr- und Versuchsanstalt für Kleintierzucht, Kiel-Steenbek.)
BONE MEAL WITH DIFFERENT AMOUNTS OF FAT IN THE DIET OF CHICKENS. *Archiv für Geflügelkunde. 19:* 186. 1955.—Five groups of 30 New Hampshire chicks each were fed with the same basal diet and a mineral supplement which varied as follows: a) mineral mixture, b) bone meal containing 12% of fat, c) bone meal containing 4.5% of fat, d) bone meal containing 2% of fat, e) special steamed bone meal. The groups did not show any significant differences in feed utiliza-

tion and growth up to an age of 8 weeks. No detrimental effect was observed in group b) by the high content of fat in the bone meal.

GRIMINGER, P., and H. M. SCOTT. (Illinois Agric. Expt. Sta., Urbana.) THE EFFECT OF DIFFERENT CEREALS ON FEED EFFICIENCY, EGG QUALITY AND SHELL THICKNESS. *Poultry Sci. 33:* 1217-1219. 1954.—White Leghorn pullets were fed all mash rations containing either corn, oats, wheat, or a mixture of all 3 as the grain, in a reversible type of experiment. The different grains did not influence egg weight, shell thickness, or standing-up quality of egg-white. The oat ration caused a decrease in egg production and loss of body weight, presumably because of the inability of the hens to consume enough of the ration to meet their energy requirement for maintenance and production.—*Paul Griminger.* (Biological Abstracts)

HAVERMANN, H. and W. HARTFIEL. (Institut für Tierzucht und Tierfütterung der Universität Bonn.) VITAMIN D 3 IN ANIMAL NUTRITION AND IT'S EVALUATION BY THE CHICKEN-TEST. *Archiv für Geflügelzucht und Kleintierkunde. 4:* 75. 1955.—The method of the chicken-test (from OLSSON) is very effective for the evaluation of the vitamin D 3-level of a feed. In this experiment the chicken-test showed that the level of vitamin D 3 in a raring mash for chickens was 16% lower than guaranteed, probably caused by a longer time of storing.

HEYWANG, BURT W. (U. S. Dept. Agric., Glendale, Ariz.) **,H. R. BIRD** (U. S. Dept. Agric., Beltsville, Md.), **and A. M. ALTSCHUL.** (U. S. Dept. Agric., New Orleans.) RELATIONSHIP BETWEEN DISCOLORATIONS IN EGGS AND DIETARY FREE GOSSYPOL SUPPLIED BY DIFFERENT COTTONSEED PRODUCTS. *Poultry Sci. 34:* 81-90. 1955.—Laying White Leghorn pullets were fed all-mash with raw decorticated cottonseed or cottonseed meal as the source of free gossypol at the .001, .002, .003, .004, .005, and .008% levels. Yolk and albumen of about 1900 of their fresh eggs and 13,000 of their eggs held in cold storage for periods varying from 1 day to 6 months were examined for discolorations. Yolks with discolorations caused by gossypol appeared in nearly 5% of all the eggs stored from pullets fed the diets with .001% free gossypol, and in nearly 60% of all the eggs stored from pullets fed the diets with .008% free gossypol. Both the per cent of eggs with discolorations caused by gossypol and the degree of discoloration increased as the free gossypol content of the diets increased. The per cent of eggs with pink discolorations of the albumen caused by an unknown component of cottonseed increased as the length of the storage period increased.—*B. W. Heywang.* (Biological Abstracts)

HEYWANG, BURT W. (U. S. Dept. Agric., Glendale, Arizona), **H. R. BIRD** (U. S. Dept. Agric., Beltsville, Md.), **and M. G. VAVICH.** (U. Arizona, Tucson.) THE LEVEL OF PROTEIN IN THE DIET OF LAYING WHITE LEGHORNS DURING HOT WEATHER. *Poultry Sci. 34:* 148-152. 1955.—In one experiment conducted during 112 days of hot weather, and in another conducted during 120 days of hot and 153 days of relatively cool and moderate weather, laying White Leghorn pullets were fed diets containing varying quantities of sardine meal and casein to bring their total protein content to about 11.5, 13.0, 15.0, 16.5, 18.0, and 19.3%. Considered collectively, the data from both experiments indicate that no increase in egg production would occur if the protein level in the diet of laying chickens were greater than 15.0% during hot weather.—*B. W. Heywang.* (Biological Abstracts)

HOHLS, H. W. (Bundesforschungsanstalt für Kleintierzucht, Celle.) THE MAXIMUM DAILY PROTEIN ANABOLISM OF LEGHORN-CHICKENS OF DIFFERENT AGE. *Archiv für Geflügelkunde. 19: 327. 1955.*—By means of breeding experiments the values of the

maximum daily protein anabolism are given for White Leghorn chickens in the age from one to eight weeks. By feeding "ad libitum" in many cases the maximum daily protein anabolism is exceeded. This is the reason that many experiments failed to give a response when antibiotic supplements are fed. The biological value of protein is also affected by the rate of the maximum daily protein anabolism. It decreases with increasing amounts of protein digested. To-day it is not favourable to decrease the costs of breeding by increasing the amount of feed digested (increasing ratio of feed for production and feed for maintenance). It is better to improve the feed efficiency by supplements without increasing the quantity of feed digested.

HOHLS, H. W. (Bundesforschungsanstalt für Kleintierzucht, Celle.)
FEEDING TRIALS WITH CHICKENS FOR DETERMINATION OF THE BIOLOGICAL VALUE OF PROTEIN AND IT'S DEPENDENCE ON THE AGE OF THE CHICKENS. *Archiv für Geflügelkunde. 19:* 1. 1955.—By measuring the weekly body weight gain of 35 lots of White Leghorn chickens and by calculating the amount of assimilated fat from the values of thermical energy measured by a respiration apparatus, the figures of the biological value of various proteins with and without supplementation of penicillin are determined. For all groups the biological value of protein decreased when the chickens became older.

KOLOUSEK J., V. LAUTNER, and Z. MULLER. (Laboratories for Nutrition and Zoohygiene, Prague, Czechoslovakia.)
PRISPEVEK K POZNANI CHEMICKEHO SLOZENI A FYSIOLOGICKYCH VLASTNOSTI KOPRIVY DVOUDOME (UTRICA DIOICA) VE VZTAHU K VYZIVE HOSPODARSKYCH ZVIRAT.—CONTRIBUTION OF THE CHEMICAL AND PHYSIOLOGICAL PROPERTIES OF THE STINGING NETTLE (UTRICA DIOICA) WITH THE REFERENCE TO ITS USE AS A FEEDING MATTER. —The determination of organic, mineral and carotene content of Utrica dioica, that proved to be high nutritionally in feeding poultry. It has higher nutrients and biocatalytic substances than alfalfa. (Orel)

KRATZER, F. H., P. N. DAVIS, B. J. MARSHALL, and D. E. WILLIAMS. (U. California, Davis.)
THE PANTOTHENIC ACID REQUIREMENT OF TURKEY HENS. *Poultry Sci. 34:* 68-72. 1955.—Turkey breeder hens were housed in pens with wire floors and were fed rations containing varied levels of pantothenic acid. Hatchability was greatly reduced when the hens were fed a deficient ration for about 5 weeks. Approximately 16 mg of pantothenic acid/kg of ration was required to maintain optimum hatchability. Egg production was unaffected even at the lowest levels of pantothenic acid fed. The level of pantothenic acid in the eggs and the survival of poults from deficient hens were directly related to the level in the ration. Wiry down in the embryos which failed to hatch and smaller poults were noted from hens in groups fed low levels of pantothenic acid.—*F. H. Kratzer.* (Biological Abstracts)

LANDAUER, WALTER. (U. Connecticut, Storrs.)
THE EFFECT OF ESTRADIOL BENZOATE AND CORN OIL ON BONE STRUCTURE OF GROWING COCKERELS EXPOSED TO VITAMIN-D DEFICIENCY. *Endocrinology 55:* 686-695. Illus. 1954. —Cockerels which had been raised on a normal diet to the age of 45 days were put on a rachitogenic diet without supplementary vitamin D or exposure to UV light. Two groups received daily intramuscular injections of 500 and 2,000 μg, respectively, of estradiol benzoate for 57 days. Control animals received corn oil. Estrogen treatment and the injection of corn oil prevented the loss of muscular control which was typical of the birds on the unsupplemented vitamin-D deficient diet. Both estrogen treatment and injected corn oil considerably improved gains in body weight. Estrogen treatment had no effect on the enlargement of the parathyroid glands which occurs as a consequence of rickets. The same is probably true for injection of corn oil. Injection of estrogen into birds which were fed a normal diet led to enlargement of the

parathyroids, but this increase in weight was less extreme than that found in birds on a vitamin-D deficient diet. Macroscopic, roentgenologic and histologic examination of long bones showed that estrogen treatment as well as injection of corn oil protected the animals against occurrence of the extreme forms of rickets, but bone structure remained for from normal. The higher dose of estrogen (2,000 μg/day) was more effective than the lower one (500 μg/day). The protective value of corn oil declined in the course of the experiment. Even those birds which received the larger amounts of estrogen showed at the end of the experiment only slight indications of hyperossification.—*Author.* (Biological Abstracts)

LAUTNER, V. and Z. MULLER. (Laboratories for Nutrition and Zoohygiene, Prague, Czechoslovakia.)

KRMNE HFOURDNOTY NEKTERYCH NASICH VODNICH PLODIN. I. CAST. [NUTRITIVE VALUE OF SOME WATER PLANTS. I. PART.] *Sbornik CSAZV, XXVII, 4:* 33-354, 1954.—Chemical and biochemical characteristics of Algae, Haepaticae, Lemnaceae and other water plants. The determination of organic and mineral compounds and of B carotene, lycopen with xanthophylls and chlorophyll. Special attention was given to the Lemnaceae, that show to be the best plant nutritional fodder. Special emphasis is given to the feeding of these plants in poultry rations. (OREL)

LIBBY, DAVID A., KYU YAWP LEE, and PHILIP J. SCHAIBLE. (Michigan State Coll., East Lansing.)

MINERAL SUPPLEMENT "IODINE X" AND BREEDING HEN PERFORMANCE. *Feedstuffs 26(52):* 35-36. 1954.—Contrary to an earlier report from Japan, hens fed this supplement at a level of 4.4% of the ration, showed no improvement in production, hatchability or egg weight. The 4-week test showed depression in each of these characteristics and also in 2-week weight and livability of chicks hatched from eggs produced by these hens. The amount of sample was too small to continue the tests.—*H. L. Wilcke.* (Biological Abstracts)

MARCH, B. E., and JACOB BIELY. (U. British Columbia, Vancouver, Canada.)

FAT STUDIES IN POULTRY. 3. FOLIC ACID AND FAT TOLERANCE IN THE CHICK.—*Poultry Sci. 34:* 39-44. 1955.—In a series of experiments with White Leghorn and New Hampshire cockerel chicks to study the effect on the chick of different levels of folic acid and fat in the diet, it was concluded that: (1) the chick was able to tolerate a higher level of fat than is normally present in practical rations; (2) the response of chicks to folic acid was modified by the level of fat in the diet; (3) the depressing effect on growth sometimes obtained upon the addition of oil to a ration containing a suboptimal level of folic acid was dependent on the quality of the oil, and in these experiments was completely counteracted by fortification of the diet with folic acid; (4) there was no evidence that folic acid aided fat absorption or had a lipotropic effect.—*J. Biely.* (Biological Abstracts)

McDONALD, M. W. (Poultry Expt. Sta., Seven Hills, N. S W., Australia.)

A FAILURE OF CHICKENS TO RESPOND TO ARSANILIC ACID. *Poultry Sci. 34:* 55-56. 1955.—In rations for growing white leghorn pullets, arsanilic acid (4.5 g/100 lb) failed to produce a response either alone or with procaine penicillin. Procaine penicillin (160 mg/100 lb) increased growth by 14%. This is evidence that arsanilic acid and penicillin may differ in the mechanism of growth stimulation.—*M. W. McDonald.* (Biological Abstracts)

MULLER, Z., and V. LAUTNER. (Laboratories for Nutrition and Zoohygiene, Prague, Czechoslovakia.)

KRMNE HODNOTY NEKTERYCH NASICH VODNICH ROSTLIN. II. CAST. [NUTRITIVE VALUE OF SOME OF OUR WATER PLANTS. II. PART.] *Sbornik CSAuV, XXVII, 5:* 451-472, 1954.—The

results of experimental feeding of Lemnaceae to chickens and ducks. Lemnaceae were fed in fresh and dried form. The biological efficiency of B carotene is compared with vitamin A preparation and proved to be of the same value. This plant is also an excellent protein food. The feeding and preservation of Lemnaceae is described. It was determined that 1 kg. of dried Lemnaceae contains 280 mg. of B carotene, which replaces 1 kg. of fish oil as to the vitamin A content. (OREL)

O'ROURKE, W. F., P. H. PHILLIPS, and W. W. CRAVENS. (U. Wisconsin, Madison.)
THE PHOSPHORUS REQUIREMENTS OF GROWING CHICKENS AND LAYING PULLETS FED PRACTICAL RATIONS. *Poultry Sci. 34:* 47-54. 1955.—Experiments were conducted with diets composed of natural ingredients and containing some phytin P to determine the P requirements of the chicken at different stages of growth. A series of 3 experiments demonstrated that P requirements of growing chickens decreased with age. Levels of P required were at least 0.73% to 3 weeks, 0.60% from 4 to 10 weeks and not more than 0.42% from 10 weeks to sexual maturity. In the 4th experiment, which was a practical application of the above concept, the P requirement for the 0-8-week-old cockerels was 0.75% while the requirement of the pullets was 0.60%. Requirement of the pullets decreased to 0.50% from 8 weeks until sexual maturity. However, the basal ration containing 0.35% P, nearly all from plant sources and deficient for maximum growth, contained sufficient P for normal date of 1st egg and egg production. Further, the pullets fed the basal ration achieved normal growth by 42 weeks. Data from 3 experiments conducted with laying pullets indicated that no more P than was contained in the basal ration, 0.43%, was needed to maintain egg production at a normal level. The requirement for P by the laying pullet could not be determined as the practical rations employed were not sufficiently low in P to demonstrate a deficiency.—*W. F. O'Rourke.* (Biological Abstracts)

PERCHEC, L., and R. RICARD.
HIGH PROTEIN CORN GLUTEN MEALS IN CHEAP CHICK MASHES. Association Scientifique du B.N.A. 81a, rue Sylvabelle, Marseille, France. Report G 165, May 1955. [Report in French.]—Since 60% protein gluten meals are now available, the authors have studied their utilization in chick mashes from the nutritional and the economic standpoint. Balanced rations are calculated with regard to their amino-acid and vitamin contents. In spite of its high cost per pound in France, the use of 5% to 10% corn gluten meal in chick mashes results in a considerable reduction in the cost of manufactured feed, allowing a larger use of cheap ingredients. (In an effort to make this report common knowledge the B.N.A. Association will be glad to lend it, provided it is returned in good condition within 45 days.)

RICHTER, K., and G. GERLACH. (Institut für Tierernährung der Forschungsanstalt für Landwirtschaft, Braunschweig-Völkenrode.)
REARING TRIALS WITH CHICKENS WITH DIFFERENT LEVELS OF FISH MEAL AND THE ANTIBIOTIC SUPPLEMENT "ENTAN." *Archiv für Geflügelkunde. 19:* 354. 1955.—The results of two experiments involving 410 Brown Leghorn chickens show very distinctly that the addition of 0.5% of a terramycin and vitamin B_{12} fermentation product decreases the animal protein requirement to 2%. The basal diet contained 6% of fish meal. The addition of an antibiotic and vitamin B_{12} fermentation product to different diets stimulates the growth of chicks and increases the feed efficiency in presence of high levels as well as in presence of low levels of fish meal.

ROSENBERG, HANS R., J. WADDELL, and JAMES T. BALDINI. (Stine Lab., E. I. du Pont de Nemours and Co., Inc., Newark, Delaware.)
THE EFFECT OF ADDED METHIONINE IN BROILER DIETS CONTAINING HIGH LEVELS OF FISH MEAL. *Poultry Sci. 34:* 114-117. 1955.—For an 8-week growing period, New Hampshire cockerel chicks were fed rations of the corn, soybean oil meal type supplemented

with 0, 5, and 15% fish meal. The last of these diets contained methionine as well as total essential sulfur-bearing amino acids in amounts well above the National Research Council allowances. In 2 experiments, significant beneficial effects in chick growth were observed not only when 0.05% DL-methionine was added to the deficient rations but also when added to the ration containing adequate amounts of methionine and total sulfur-bearing amino acids according to present standards.—*H. R. Rosenberg* (Biological Abstracts)

ROSENBERG, M. M. (U. Hawaii, Honolulu.)
RESPONSE OF CHICKS TO GRADED CONCENTRATIONS OF CANE FINAL MOLASSES. *Poultry Sci. 34:* 133-140. 1955.—Cane final molasses was fed to day-old New Hampshire chicks for 42 days in graded concentrations ranging to 34.5% of total ration. Levels of molasses up to 23% did not depress the chicks' growth rate to 6 weeks of age in trial 1. Whereas male chicks fed 34.5% molasses of total ration grew significantly slower than their control (92.0% as heavy), female chicks grew about as well as their control (98.6% as heavy). The pullets fed 11.5% molasses were significantly heavier than their control in this trial. Rations tested in trials 2 and 3 were modified somewhat, and the same rations were then fed in 2 trials started 5 weeks apart. When the individual cockerel weights from both trials were combined, it was found that the lots fed rations containing 11.5 and 16.5% molasses were significantly heavier than the controls, whereas no real difference existed between the controls and the other 4 combined lots. In these trials, the cockerels fed 34.5% molasses weighed 97.9% as much as the controls. Among the pullets, the lots fed 7.5% molasses were significantly heavier than their controls, but no real difference existed between the average body weight of the controls and the other molasses-fed lots. Pullets fed 34.5% molasses weighed 102.4% as much as their controls. Efficiency of feed conversion into body-weight gain decreased significantly as the concentration of molasses was raised. However, an analysis of cost data from trials 2 and 3 showed that, with the exception of ration 6 (trial 2 only), all the molasses-style rations produced a pound of gain cheaper than the control ration to either 21 or 42 days of age under the conditions of this investigation. There did not appear to be any direct relationship between concentration of molasses and chick livability to 42 days of age. These studies show that cane final molasses can be fed to day-old chicks at concentrations up to 34.5% of total ration with concurrent savings in cost of feed per pound of gain. The optimum levels, as determined by growth rate and cost of feed per pound of gain, were obtained on concentrations of molasses ranging from 7.5 to 23.0% of total ration.—*M. M. Rosenberg.* (Biological Abstracts)

ROSENBERG, M. M., and EUGENE SEU. (U. Hawaii, Honolulu.)
TOLERANCE OF GROWING CHICKENS TO SOLUTIONS OF HAWAIIAN SALT. *World's Poultry Sci. Jour. 10:* 343-351. 1954.—Salt (dehydrated ocean water 57.9% Cl, 38.6% Na, 0.18% Ca, 0.42% Mg) was not injurious in chick diets to 6 weeks at levels of 0-150 grains/gallon of drinking water (0-0.26%). Slower growth appeared at 300 grains, 350 grains and 550 grains in different tests. Mortality increased with levels over 200 grains, and was associated with edema. Water consumption increased as it contained more salt. Levels of 400 grains were not injurious to cockerels or pullets over 6 weeks old. *J. B. Christiansen.* (Biological Abstracts)

SALEM, HASSAN, and HUSSEIN REDA. (Cairo U., Egypt.)
CALCIUM AND PHOSPHORUS METABOLISM ANG EGG SHELL FORMATION IN EGYPTIAN BIRDS. *Poultry Sci. 34:* 197-205. 1955.—A series of experiments on the daily retention of Ca and P were made using laying hens to show the connection of these elements and egg shell formation. High Ca diets result in a lower retention of Ca, also depressed the retention of P. It was definitely established that there was a rise in blood Ca associated with formation of egg shell. Diethyl-stilbestrol hormone when given to birds raised the blood Ca level. Blood P level was very high on days eggs were laid; no change in

the P level of blood when birds were given hormones.—*H. M. Salem.* (Biological Abstracts)

SCOTT, M. L. (Cornell U., Ithaca, N. Y.), **EARL R. HOLM** (New York State Conserv. Dept., Albany), **and R. E. REYNOLDS.** (New York State Game Farm, Ithaca.)
STUDIES ON PHEASANT NUTRITION. 2. PROTEIN AND FIBER LEVELS IN DIETS FOR YOUNG PHEASANTS. *Poultry Sci. 33:* 1237-1244. 1954.—Results presented show that the protein requirement of pheasant chicks is 28% for the first 2-3 weeks of age and may be reduced to 24% for the 3-5 week growth period. Evidence is also presented showing that growth, feathering and general body development is satisfactory or superior on rations fairly high in fiber content when the fiber is supplied in the form of pulverized oat hulls.—*M. L. Scott.* (Biological Abstracts)

SCOTT, M. L. (Cornell U., Ithaca, N. Y.), **EARL R. HOLM** (New York State Conserv. Dept., Albany.) **and R. E. REYNOLDS.** (New York State Game Farm, Ithaca.)
STUDIES ON PHEASANT NUTRITION. 3. EFFECT OF ANTIBIOTICS, ARSENICALS AND THYROACTIVE COMPOUNDS UPON GROWTH AND FEATHERING IN PHEASANT CHICKS. *Poultry Sci. 33:* 1261-1265. 1954.—The results presented show that supplementation of a good diet with antibiotics causes an increase in pheasant chick growth which is intermediate between that which was reported for chicks and turkey poults. Results obtained with 3-nitro-4-hydroxy phenylarsonic acid and with thyroactive compounds are presented and discussed.—*M. L. Scott.* (Biological Abstracts)

SPINKA, J., Z. MULLER, and V. LAUTNER. (Laboratories for Nutrition and Zoohygiene, Prague, Czechoslovakia.)
VYZNAM ACIDOFILNIHO MLEKA VE VYZIVE HOSPODARSKYCH ZVIRAT. [THE IMPORTANCE OF ACIDOPHYILISED MILK IN ANIMAL NUTRITION.] *Sbornik CSAZV, XXVII, 6:* 525-545, 1954.—It was found that Bacillus acidophilus produces in sterile milk vitamin B_{12}. Microbiological tests and experimental feeding of chickens and pigs. It was stated that Bacillus acidophilus is a potent producer of lactic acid and that does not produce such quantity of volatile acids as do the other strains of this bacteria. The acidophilised milk proved to increase the live weight and the haemoglobin blood level. (Orel)

TAYLOR, T. G., and J. H. MOORE. (U. Reading, Eng.)
SKELETAL DEPLETION IN HENS LAYING ON A LOW-CA DIET. *Brit. Jour. Nutrition 8(2):* 112-124. 1954.—Eight Light Sussex pullets were maintained on a high (1.9%) Ca diet up to the time they laid their 3rd egg. After this, 6 pullets were placed on a low (0.26%) Ca diet, and allowed to lay 2, 4, and 6 eggs, after which they were slaughtered. The 2 control birds were slaughtered when taken off the high Ca diet. Eggs, droppings and skeletons of the birds were analyzed for Ca and P. After laying 2, 4 and 6 eggs on the deficient diet the mean skeletal losses of Ca were 16.3, 25.2 and 38.4%, respectively. Percentage losses of P were slightly less than those of Ca, throughout. Ratio of Ca:P stored during the pre-depletion period was 4.25. Ca and P losses varied greatly among individual bones during the depletion period. In birds laying 6 eggs on this regime the ribs, sternum, ilium, ischium, pubis, coccygeal vertebrae and fibula all lost over 50% of their original mineral content. Bones drawn upon least were the skull, metatarsus and toes. The 2 birds that laid 6 eggs on the deficient diet each lost over 38% of the total skeletal Ca initially present, in 10 and 12 days. During the course of depletion the bone mineral that remained behind had a Ca:P ratio that became progressively lower as depletion continued.—*J. E. Oldfield.* (Biological Abstracts)

THAYER, ROLLIN H., and V. G. HELLER. (Oklahoma Agric. Expt. Sta., Stillwater.)
ANTIBIOTICS AND NITROGEN UTILIZATION IN GROWING COCKERELS. *Poultry Sci. 34:* 97-102. 1955.—A N balance study was made with 4-week-old New Hampshire cockerels to determine the effect of orally administered penicillin and Aureomycin upon dietary N utilization. These antibiotics increased the amount of dietary N absorbed from the intestinal tract, increased the percent of absorbed dietary N retained in the cockerel's body and decreased the per cent of absorbed dietary N excreted as urinary N.—*R. H. Thayer.* (Biological Abstracts)

TRIVELIN, A. P. (U. São Paulo, Brazil.)
TANCAGEM DE CACAU COMO ALIMENTO PARA PINTO. *Rev. Agric.* [*Piracicaba*] *29(7/8/9):* 223-231. 1954.—Feeding trials with New Hampshires and White Leghorns established that cocoa tankage, with theobromine and caffeine removed, could replace 10% standard middlings without affecting viability. No toxic effects were noted when 25% of the ration was cocoa tankage, but the authors recommend not going above the 15% level. Cacao tankage has a high Ca content.—*F. P. Jeffrey.* (Biological Abstracts)

Van DOREN, FR. (Hen's Exptl. Sta., Kapellen, Belgium.)
EXPERIMENT ON PALATABILITY OF GRAINS. *World's Poultry Sci. Jour. 10:* 352-354. 1954.—Pullets (237) in laying cages at 65% production were tested for feed preference. About 28% ate indiscriminately. Mash was liked less than grains. Sunflower seed corn and sorghum were liked less than buckwheat, barley and wheat.—*J.B. Christiansen.* (Biological Abstracts)

WAIBEL, PAUL E., O. J. ABBOTT, C. A. BAUMANN, and H. R. BIRD. (U. Wisconsin, Madison.)
DISAPPEARANCE OF THE GROWTH RESPONSE OF CHICKS TO DIETARY ANTIBIOTICS IN AN "OLD" ENVIRONMENT. *Poultry Sci. 33:* 1141-1146. 1954.—During the period August 1950-May 1952, the addition of penicillin or Aureomycin to nutritionally adequate diets consistently increased the growth of chicks. The percentage response to antibiotic appeared to be influenced by the type of diet fed, but attempts to improve the basal diet by various supplements failed to eliminate the response to the antibiotics. From June 1952 to July 1953, these antibiotics no longer increased the growth rate of chicks fed good diets. This lack of response could have been due to a change in the microbial population associated with the decrease in the moisture in the room brought about by a change in cleaning practices; another possibility is that harmful bacteria had been eliminated through the long-continued use of antibiotics. These results are in harmony with the concept that antibiotics stimulate growth both by sparing required nutrients and by decreasing low-grade infections.*P. E. Waibel.* (Biological Abstracts)

WAWRZYNIAK, MAREK. (Vet. Dept. U. Lublin, Poland.)
BADANIA CYTOCHEMICZNE NAD WITAMINEM C W NADNERCZACH KURA DOMOWEGO. [CYTOCHEMICAL INVESTIGATIONS ON VITAMIN C CONTENT OF THE DOMESTIC HEN ADRENALS.] *Ann. Univ. Mariae Curie-Sklodowska Sect. DD. Vet. Med. 7(8):* 189-208. 1952. [1954].—Five leghorn cockerels were given intramuscular injections of 100 mg vitamin C in the region of the thorax on the 1st, 2nd, 3rd, 4th and 5th day of the 9th week of age. One of them was killed 6 hours following the first injection; the 2nd, 6 hours following the last injection. The remaining were sacrificed in weekly intervals. Five other cockerels were used as controls. The results obtained suggested that the vitamin C content of the hen adrenals keeps on increasing as the fowl matures. Exogenous administration of the vitamin caused an additional increase in the vitamin content of the adrenals until a saturation point was reached. An intensive reaction to the vitamin takes place in the cells of the main fasciculi and in the chromophilic cells adjoining the blood vessels.—*L. I. Hallay.* (Biological Abstracts)

WEETH, H. J., and M. M. ROSENBERG. (U. Hawaii, Honolulu.)
EFFECTS OF CANE FINAL MOLASSES ON CERTAIN CATIONS IN THE SERUM AND BONES OF CHICKS. *Poultry Sci. 33:* 1135-1140. 1954.—Cane final molasses contains approximately 3.30% K and 0.39% Mg. Since these cations may act antagonistically on Ca assimilation, the effect of feeding high levels of molasses was investigated. Chicks fed from birth to 3 weeks on balanced rations containing 0.0, 11.5, and 23.0% cane final molasses had equal growth rates. No debilitating diarrhea was encountered. When sacrificed, at 3 weeks of age, blood serum Mg, K, and Ca were higher in chicks fed the molasses rations. The assimilation of Ca by the bones and bone growth were normal in the molasses-fed chicks. At the levels fed, there was no indication that the K and Mg of molasses origin were detrimental to Ca metabolism. —*H. J. Weeth.* (Biological Abstracts)

WEST, JOHN W. (Mississippi State Coll., State College.)
COTTONSEED MEAL IN POULTRY RATIONS. *Flour and Feed 55(7):* 3-6. 1954.—Degossypolized solvent extracted cottonseed meal may be used in practical-type broiler and turkey starter rations to replace a large part of the more conventional type plant proteins such as soybean meal. Complete substitution of soybean meal with cottonseed meal resulted in a reduced growth rate for broilers and poults, and reduced feed efficiency in most cases. Caution must be exercised in feeding cottonseed meal to poultry. Meals of low gossypol content are preferred. Cottonseed meals suitable for cattle feeding may not be suitable for chicks and poultry in large amounts. Meals produced by the hydraulic or expeller methods may be of low feeding value for poultry because of overheating.—*M. B. Gillis.* (Biological Abstracts)

WOOLLAM, D. H. M., and J. W. MILLEN. (Dept. Anatomy, U. Cambridge.)
EFFECT OF VITAMIN A DEFICIENCY ON THE CEREBROSPINAL FLUID PRESSURE OF THE CHICK. *Nature 175(4444):* 41-42. 1955. (Biological Abstracts)

ZNANIECKA, G., A. SLIWINSKI, and J. WODZINOWSKI. 1955. (Instytut Zootechnikiz ZD Pawlowice.)
DUCKWEED SILAGE AS A FEED FOR DUCKS. [KISZONA RZESA JAKO PASZA DLA KACZEK]. *Roczniki nauk rolniczych, Tom 69-B-2: 259-266.*—In order to enable feeding of duckweed *(Lemna gibba L.)* during the winter months, a silage was prepared with steamed potatoes in a proportion of 1:1 with an addition of 2% of curdled milk.

A very good quality of silage was obtained, without butyric acid and with a pH = 4.3. After a 7-month period of storage this silage was fed to ducks during 2 months of the breeding season.

An experimental group of 20 ducks received 200 g of the duckweed silage, the control group of 100 g of potatoes ensiled without the duckweed and 10 g of alfalfa hay per duck daily. The remaining feed ration was the same in both groups. Eggshell meal was fed ad libitum.

Egg production of the experimental group was 17.3 per duck as against 12.8 in the control group. The weight of experimental ducks has slightly increased, these of the control have somewhat fallen.

The percent of fertile eggs was 95.5 in the experimental and 93.9 in the control group.

The percent of healthy hatched ducklings was correspondingly 83.3 and 79.7.

All of the ducks were healthy during the time of the experiment in spite of the fact that the quantity of silage fed was several times greater than the amount adopted in feeding standards.

A good quality silage of duckweed with potatoes can be fed to ducks during breeding season without any detrimental effect to health or productivity.

PATHOLOGY

BANKOWSKI, R. A., and D. E. STOVER. (U. California, Davis.)
INFECTIOUS BRONCHITIS. *California Agric. 8(5):* 14-15. 1954. —Vaccines released for treating infectious bronchitis (virus) infected birds have not yet been tested for laying hens.—*G. W. Bohn.* (Biological Abstracts)

CSONTOS, L., D. DERZEY, and I. TOTH BARANYI. 1955.
LISTERIOSIS OF YOUNG GEESE. (LISTERIOSIS FIATAL LIBAKON) *Magyar Allatorvosok Lapja.* Budapest, 4. pp. 110-114.—Among young geese of a big farm heavy losses occurred due to an infection with a gram-positive organism. As a result of the disease, 40 per cent of goslings younger than three weeks and 0.5 to 20 per cent older ones died. Based on morphological, cultural, biochemical and pathogenic properties, the isolated strains were identified as Listeria monocytogenes. In cross agglutination examinations made with Listeria strains of sheep origin it was established that sera prepared with the newly isolated strains agglutinated sheep strains while in an inverse way no agglutination was obtained.

In experiments on the therapy of the disease 5.5 per cent of animals treated with Ultraseptyl and 1.5 per cent of animals treated with aureomycin died while in the untreated control group kept under similar conditions there was a loss of 24 per cent. (Hungarian Agricultural Review)

FRITZSCHE, K. (Landes-Veterinäruntersuchungsamt Rheinld. Pfalz, Koblenz)
TREATMENT OF TRICHOMONIASIS IN PIGEONS. *Zentr. blatt für Veterinärmedizin II, 4:* 392. 1955.—1. In clinically healthy pigeons the predilection site of Trichomonads is the mucosa of the crop and not that of the pharynx. 2. Microscopical diagnosis is therefore better made with films from the crop. 3. OsmaronB and Enheptin powder are not entirely satisfactory for the treatment of trichomoniasis in adult pigeons. The best form of treatment is the administration of soluble Enheptin in the drinking water for a period of six days at a level of 0.125%. At this level the drug is very effective and is well tolerated.

JERSTAD, A. C., and E. E. JOHNS.
FIELD TRIALS OF A BACTERIN FOR THE CONTROL OF ERYSIPELAS IN TURKEYS. *Jour. Amer. Vet. Med. Assoc. 125(931):* 288-291. 1954.—Erysipelas mortality and total mortality was lower in breeder turkeys vaccinated with 2.0 ml of an *Erysipelothrix rhusiopathiae* bacterin than in unvaccinated controls in the same flock. No significant difference in mortality was found between groups of hens in the same flock vaccinated with either 2.0 ml or 3.0 ml of the bacterin at 292 days of age. Highly significant increased resistance to erysipelas was demonstrated in a group of hens given 2.0 ml of the bacterin at 112 and again at 292 days of age when compared with hens in the same flock given 3.0 ml at 292 days of age only. No significant difference in mortality was demonstrated between a group of toms vaccinated twice with 2.0 ml at 112 and 292 days of age and another group of toms in the same flock given 4.0 ml of the bacterin at 292 days of age only.—*Auth. summ.* (Biological Abstracts)

NEMESERI, L. 1954
A STUDY OF THE POSSIBILITIES OF SPREADING THE CECAL COCCIDIOSIS OF CHICKS THROUGH THE EGG SHELL. [IZUCSENIE VOZMOZSNOSZTI RASZPROSZTRANIJA TENNELOZA PRI PORZSEDSZTRE JAJCEVOJ SZKORLOPU.) *Acta Veterinaria.* Budapest. 2-3, pp. 183-187.—The sporulated oocysts of E. tenella adhering to the shell surface die in the incubator during the 21 days of incubation. Death is caused through the exsiccation of the oocysts.

Consequently the oocysts adhering to the shell of incubated eggs do not play a role in spreading the disease and thus the disinfection of the egg shell before incubation with an aim to control cecal coccidiosis is

considered unnecessary. (Hungarian Agricultural Review)

PULLIN, J. W. (Animal Path. Div., Canada Dept. Agr., Macdonald Coll., Quebec, Canada.

OBSERVATIONS ON THE USE OF CORTISONE IN EXPERIMENTAL ENTEROHEPATITIS IN TURKEYS. *Canadian Jour. Comp. Med. and Vet Sci. 19(2):* 67-68. 1955.—Poults were infected with 1000 embryonated eggs of *Heterakis gallinae*. Cortisone was given intramuscularly in doses of 5 mg/bird. One group was started 1 day before infection and continued for 18 days. Treatment in the 2nd group was from 12th to 18th days and the 3rd group was untreated. The dosage was based on 1.5 mg/lb. Treatment did not modimy the course of experimental enterohepatitis.—*R. Gwatkin.* (Biological Abstracts)

SZAKMARY, G., and L. BEKE. 1955.

CAN A-FEW-WEEKS-OLD CHICKENS BE SUCCESSFULLY IMMUNIZED AGAINST FOWL-PEST BY MEANS OF THE H (HERTFORDSHIRE) VACCINE? [IMMUNIZALHATOK-E H (HERTFORDSHIRE)-VAKCINAVAL A NEHANYHETOS CSIREK BAROMFIPESTIS ELLEN?] *Magyar Allatorvosok Lapja.* Budapest. 1955, 5 pp. 158-161.—Authors examined the development of immunity on one-, three- and five-weeks old chicks also possessing an inherited immunity, after vaccination with H-vaccine. The experiments were conducted on healthy, well-growing chicks kept under excellent conditions. The following points were established:

1. One-, three- and five-weeks old chicks possess an inherited immunity high enough to be vaccinated with H-virus without losses.

2. Chicks in the age of one week cannot be successfully immunized and, in spite of H-vaccination, remain susceptible to subsequent contamination. However, three- and five-week old chicks, if immunized in a proper way, acquire a satisfactory immunity lasting till at least 11 weeks of age.

In case of three- and five-week old chickens, both the vaccination by the wing stick method and the subcutaneous injection of vaccine proves to be effective. For several reasons, however, the latter method is to be preferred. By rubbing the vaccine into the feather follicles favourable results were obtained only in some of the five weeks old chicks. Spraying the virus onto the outer mucous membranes proved to be ineffective. (Hungarian Agricultural Review)

POULTRY PRODUCTS AND MARKETING

HIXON, R. R., and G. F. STEWART. (U. California, Davis.)

DETECTION OF WASHED EGGS WITH ULTRAVIOLET LIGHT. *Food Technol. 9(2):* 67-69. 1955.—A method for detecting washed eggs using appearance under UV light was devised and tested. Change in fluorescence permitted easy differentiation, even though differencess could only be described in qualitative terms. Laboratory and field trials showed that detection of washed eggs (and also unwashed ones) could be made with an average accuracy in the range 80-100%.—*Authors.* (Biological Abstracts)

MacDONNELL, L. R., R. E. FEENEY, H. L. HANSON, AGNES CAMPBELL, and T. F. SUGIHARA. (Western Utilization Res. Branch, Agric. Res. Serv., U. S. Dept. Agric., Albany, Calif.)

THE FUNCTIONAL PROPERTIES OF THE EGG WHITE PROTEINS. *Food Technol. 9(2):* 49-53. 1955.—Chemical fractionation of egg white into its principal protein constituents has shown the contribution of each to the performance of egg white in the preparation of angel cakes. The constituents found to be important are the globulins (including lysozyme), the ovomucin, and the ovalbumin. The globulin fraction is in large part responsible for good foaming, while ovomucin appears to stabilize the foam. The structure of the baked cake is dependent upon the presence of sufficient heat denaturable protein, and this function is served primarily by the ovalbumin.—*L. R. MacDonnell.* (Biological Abstracts)

OREL, V., and F. MUSIL. (Research institut for Milk and Egg, Praque.)
KONTROLA NASYCENOSTI VAPENNEHO ROZTOKU PRI KONSERVACI VAJEC VE VAPENKACH. [THE CONTROL OF SATURATION OF THE LIME WATER DURING EGG PRESERVATION.] *Prümysl potravin, 1955, VI, 6:* 295-7.—A new method for the control of the saturation and preservation efficiency of the lime water during egg preservation is proposed. The method is proposed for the use in the preservation cellar. A sample of the lime water is taken from the preservation container in the depth of 20-30 cm below the surface layer and brought by means of a 10 ml pipete to the test tube. This test tube has the mark for 10 ml of the lime water and under the lime water a scale for further 10 ml for testing the salt soln. Lime water with 100% of saturation contains 1,82 g $Ca(OH)_2$ in 1000 ml and on the scale 0,1 ml corresponds to 1% of the saturation. Thus the whole scale is for the saturation from 1 to 100%. The testing salt soln is prepared from 491,2 ml 0,1N HCl diluted with destilated water to 1000 ml.

To the 10 ml of the lime water is added a drop of the phenolphtalein solution and afterwards the testing salt soln up to getting the whole solution clear. The surface of this solution at this moment corresponds on the scale to the % of saturation.

For the lime water in the cellar with a temperature of 10°C the optimal saturation above 75% is recommended. If the saturation of the lime water is below 50% there is a danger that the lime water and preserved eggs will perish. In this case the change of the water is recommended.—*V. Orel.*

ZIEGLER, FRANK. (State Coll. Washington, Pullman), **and W. J. STADELMAN.**
THE EFFECT of AUREOMYCIN TREATMENT ON THE LIFE OF FRESH POULTRY MEAT. *Food Technol, 9(2):* 107-108. 1955.—Paired halves of 36 chicken fryers were studied. Halves were immersed for 10 minutes in water solutions containing 0, 10, 20 or 40 ppm. Aureomycin prior to packaging. Shelf life of the poultry meat stored at 36°F (2.2°C) was increased from 8.7 to about 14 days by this treatment.—*W. J. Stadelman.* (Biological Abstracts)

MANAGEMENT

GERRIETS, E., C. WERNER, and H. STAHL. (Abteilung für Geflügelkrankheiten, Humboldt-Universität Berlin.)
BIOCLIMATIC STUDIES ON THE HEN WITH DIFFERENT CONDITIONS OF HOUSING. *Archiv für Geflügelkunde, 19:* 276. 1955.—After an introductory discussion concerning the construction and the veterinary-hygienic details of different types of poultry houses and after discussion of bioclimatic investigations of human and veterinary medicine with special consideration to the problem of open houses for cattle and poultry breeding, a one year's test with four hen houses of different types is described.—In spite of unfavourable weather conditions in the testing year of 1953/54 it was not possible to produce, experimentally, sicknesses of the upper breathing organs by the different housing conditions. Both of the extreme groups (solid hen house, open-front-house) had, as it was to be expected, a lower performance than the other groups. The favourable conditions regarding dampness of air in the open-front-house prove that more stress is to be put on house ventilation, especially in autumn and winter. An increased food consumption on account of the cold weather could not be observed. Frost damages to eggs have been avoided because the eggs were taken off every two hours.

KAKUK, T., and I. DEBRECENI. 1955.
RAISING CHICKS ON DEEP-LITTER. [CSIBENEVELES MELYALMON.]*Magyar Allatorvosok Lapja,* Budapest. 2. pp. 53-57.—Authors describe the advantages to be expected of the deep-litter system as regards heat production and the supply of vitamin B_{12}. Following

this, a report is given about the results of growth and death rate of 8900 chickens raised on deep-litter with horse dung on 4 state farms. Based on the data obtained it is concluded that the deep-litter system with horse dung is well apt to decrease losses during rearing and to increase the rate of growth in chickens. Concerning the spreading of fowl typhoid and coccodiosis no particular dangers are implied. On the contrary, due to an increase of natural resistance, losses caused by these agents are reduced. (Hungarian Agricultural Review)

KARAPETIAN, S. K.
VLIIANIE UDLINENNOI SVETOVOI EKSPOZITSII NA PRODLENIE BIOLOGICHESKOI I PRODUKTIVNOI ZHIZNI DOMASHNIKH PTITS. [INFLUENCE OF LENGTHENING OF EXPOSURE TO LIGHT ON THE PROLONGATION OF THE BIOLOGICAL AND PRODUCTIVE LIFE OF DOMESTIC FOWLS.] *Doklady Akad. Nauk SSSR 94(3):* 585-588. 1954.—Supplementary light extending the exposure to light up to 16 hours/day has a favorable effect on the biological functioning and productivity of chickens, not only for young birds in the 1st or 2d year of life, but for those 3-7 years old. (Biological Abstracts)

MEHNER, A. (Landesgeflügelzuchtanstalt an der Landw. Hochschule Stuttgart-Hohenheim.)
THE INFLUENCE OF THE LAYING BATTERIES ON THE LAYING PERFORMANCE. *Archiv für Geflügelkunde. 19:* 153. 1955.—In an experiment with two groups of hens with a well balanced egg production, one group was kept in a battery and the other one on deep litter. The battery group showed a significantly lower egg production. The feed consumption of the hens in the battery was a little lower than the one on deep litter. The growth differences in both groups were not significant, however, the feed conversion of the hens on deep litter was much more favourable. In a corresponding experiment with pullets there was an insignificant difference in the egg production in favour of the birds kept on deep litter. The feed consumption of the battery-pullets was a little lower, the weight gains and feed conversion were practically the same in both groups. This shows that pullets overcome the change connected with battery keeping better than hens. Hens kept in batteries more react on lower temperatures than those kept on deep litter. The considerable costs for laying batteries were not confronted with an increased egg production. However, constant culling and immediate supply of new birds may produce a high performance per battery-cage, if the farm is adapted to breeding and rearing chickens all the year.

RICARD, R., R. HIERS, and PERUCHON de BROCHARD.
PRACTICAL DATA, PLANNING AND CALCULATION IN POULTRY HOUSE VENTILATION. *Association Scientifique du B.N.A.*—81a, rue Sylvabelle, Marseille, France. Report 169, July 1955. (Report in French).—Since the number of battery raised chickens is increasing every year in Europe, and especially in France, the authors have drawn attention to the lack of artificial ventilation in the overcrowded poultry houses. This situation has resulted in high mortality, low rates of growth, loss of appetite, reduced feed efficiency etc.

This accurate physiological study, adapted from American data together with a new theory on the chicks' physiological welfare, is followed by descriptions and drawings of new prefabricated poultry houses and new methods of ventilation.—(In an effort to make this report common knowledge the B.N.A. Association will be glad to lend it, provided it is returned in good condition within 45 days.)

SNYDER, E. S., W. F. PEPPER, S. J. SLINGER, and H. L. ORR. (Ontario Agric. Coll., Guelph, Ontario, Canada.)
THE VALUE OF PASTURE IN THE PRODUCTION OF GOOSE BROILERS. *Poultry Sci. 34:* 35-38. 1955.—Duplicate groups of White Chinese x Emden goslings were reared from 3 to 14 weeks of age on a

diet of pelleted mash and grain both with and without access to pasture. The groups reared in confinement without access to pasture were significantly heavier in weight and of somewhat superior market quality at 14 weeks of age as compared with the pastured groups. On the other hand, the pasture-reared groups required less feed per unit gain in weight and consumed a great deal less pelleted mash in relation to grain than did the groups receiving no pasture. It would appear possible to produce goose broilers of satisfactory weight and market quality at 14 weeks of age either with or without pasture. Under the conditions of this experiment the economy of such production was materially enhanced through the use of pasture.—*Auth. summ.* (Biological Abstracts)

GENERAL

DERBAL, Z.

L'AVICULTURE AU SOUDAN FRANCAIS. [POULTRY BREEDING IN THE FRENCH SUDAN.] *Bull. Tech. Inform. Ingénieurs Serv. Agric. 86:* 59-70. Illus. 1954.—Poultry breeding is carried on in the bush or in the living centers. Diseases are numerous and often ruinous. Poultry production improvements should include importation of improved breeds, artificial incubation, importing of 1-day-old chicks, betterments of feeding and habitat.—*M. Claude.* (Biological Abstracts)

HARVEY, J. D., D. B. PARRISH, and P. E. SANFORD. (Kansas State Coll., Manhattan.)

IMPROVEMENTS IN THE TECHNIQUE OF DEUTECTOMY OF NEWLY HATCHED CHICKS, AND THE EFFECTS OF THE OPERATION ON THEIR SUBSEQUENT DEVELOPMENT. *Poultry Sci. 34:* 3-8. Illus. 1955.—Some modifications in the technique of deutectomy of newly hatched chicks are described. They involve using an operating block to which the chicks are strapped, making an incision with a single stroke of a scalpel and providing means to collect the yolk when desirable to save it for analysis. Use of the modified technique reduces the time required for the operation. Survival after deutectomy by experienced operators in 7 experiments was 86-100% of that of unoperated controls. Growth of deutectomized chicks was impaired slightly during the first 2 weeks. Feed consumption and efficiency also were reduced during the same period. Between 3 and 8 weeks of age, no consistent differences were found between deutectomized and unoperated chicks in gains, feed consumptions, and feed efficiencies. The evidence indicated that the condition of deutectomized chicks should not prevent their use in many nutritional and metabolic studies.—*J. D. Harvey.* (Biological Abstracts)

KEIL, F. (Institut für Tierzucht der Universität Müchen.)

STUDIES ON THE ETHOLOGY OF THE ARTIFICIAL INCUBATED CHICK ESPECIALLY DURING THE FIRST DAY OF LIFE. *Archiv für Geflügelkunde. 19:* 201. 1955.—Studies were made of the reaction of day-old chicks to thermal, visual and acustic stimuli, presented for releasing a vocal response and the trailing reaction (Trailing reaction = moving of the chicks as they follow the moving mother). 1. The decisive importance of warmth to the day-old chick was verified by its vocal reaction. 2. A thermal stimulus under natural conditions is of no significance on inducing the chicks to come to the clucking hen. 3. Among visual stimuli movable and moving objects attracted the chicks, especially if the objects were not larger than a human hand. Stationary and moving models, visually stimulating a broody hen, did not release these reactions. 4. Objects abruptly moved or noises did not induce a fright reaction in chicks. 5. The "trailing reaction" was released best by a stimulated clucking. A good releasing effect was noted when the observer made noises in rapid repetition, as long as they were short, concise and somewhat rough. 6. Imprinting was observed to persons and their sounds. 7. The chicks would adopt a second person. 8. Replacement of a person by a hen may be possible too. 9. The breed of chickens was not important in these tests.

PLATT, S. C. (Rutgers U., New Brunswick, N. J.)
REPORT OF THE EGG LAYING TEST COMMITTEE OF THE WORLD'S POULTRY SCIENCE ASSOCIATION. *World's Poultry Sci. Jour. 10:* 317-326. 1954.—Eggs per bird and per survivor, duration of test, number entered, mortality and partial egg and body weight data are reported for egg laying contests in 12 countries and 10 U. S. states. —*J. B. Christiansen.* (Biological Abstracts)

SCHWARZ, L., and J. HENSVHEL. (Hygienisches Institut, Hamburg.)
STUDIES CONCERNING THE TRANSPORT OF HATCHING EGGS BY AIRPLANE FROM OVERSEAS. *Archiv für Geflügelkunde. 19:* 176. 1955.—In confirmation of FRAP'S results our studies show that up to a height of 12 km the reduction of air pressure does not damage hatching eggs. Passenger and cargo planes do not go higher up than 12 km according to personal information at the Hamburgian airport.

We are convinced that especially a combined effect of shaking, cold and reduction of air pressure damages hatching eggs. We think, however, we are right in saying that in air traffic hatching eggs are mainly damaged by vibrations and possible shock effects when the plane is landing. This shaking and shock effect could be eliminated by a suitable transport box which is described.

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BRANCH ORGANIZATIONS OF THE WORLD'S POULTRY SCSIENCE ASSOCIATION

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BRANCH NEWS

The United Kingdom Branch held one of its two Annual Conferences on 8th December, 1955, at Olympia, London, on the occasion of the National Poultry Show. There was an attendance of slightly over 400 and the Conference was undoubtedly one of the best so far held.

The subject of the Conference was "Hybrids, Crosses or Purebreds—The Best for Commercial Egg Production." Mr. Cyril Thornber of Thornber Bros. Ltd. of Mytholmroyd, nr. Halifax, Yorkshire, took up the cudgels on behalf of Hybrids and Mr. Y. Watanabe, M.A. (Cantab.) of Suma Poultry Farm, Hatchford, Cobham, Surrey, advocated the claims of Crosses and Purebreds. Both papers were excellent and their submission was followed by a very lively and animated discussion. On the termination of the discussion an interesting summing-up was given by Mr. G. E. Mann, M.C.M.A., of the National Agricultural Advisory Service of Huntingdone, St. Michaels, Tenterden, Kent, who expressed himself as in favour of hybrids generally as long as the talk was concerned with egg production. (See page 16)

The Annual General Meeting of the Branch will be held at 10:45 hours on Friday, 20th April, 1956 at the Royal Veterinary College, Royal College Street, London, N.W.1. The meeting will be followed by a Conference at which it is hoped to arrange for the presentation of papers on "Poultry Behaviour" and "Artificial Insemination of Poultry" followed by discussion.

WORLD'S POULTRY SCIENCE ASSOCIATION GRANTED SPECIALIZED CONSULTATIVE STATUS BY THE FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS

At the meeting of the Council of the World's Poultry Science Association held on the occasion of the 10th World's Poultry Congress, it was decided to apply to the Food and Agricultural Organization of the United Nations for the grant of Specialized Consultative Status.

This has been granted which entitles the Association to the following privileges.

Organizations granted specialized consultative status: (a) shall be entitled to send observers to appropriate technical meetings with the approval of the Director-General, to attend appropriate meetings of the Committee on Relations with International Organizations, to receive appropriate publications, and to submit memoranda to the Organization on technical aspects of the FAO program of mutual specialized interest: they shall be provisionally invited, subject to approval, as appropriate, by the Conference and Council, to send an observer to Conference Sessions and in appropriate cases to Council Sessions: (b) may be invited by the Director-General to participate in experts' meetings, technical conferences or seminars on subjects which fall within their fields of interest; where participation does not occur, they may submit their views in writing to any such meeting or technical conference; (c) will receive non-confidential documentation and information about such meetings; (d) may submit to the Director-General, under the authority of their governing body, written statements on program matters coming within their specialized competence, not exceeding 2,000 words, in one of the working languages of FAO; the Director-General may place these statements before the Council Committee on Relations with International Organizations.

Conversely, these organizations shall undertake to: (a) co-operate fully with FAO for the furtherance of the objectives of the Organization within their specialized fields; (b) in co-operation with the competent services of FAO, determine the ways and means of coordinating activities in these specialized fields, with a view to avoiding duplication and overlapping; (c) in order to achieve this aim, accord a representative of the Director-General invitations to attend and participate in the meetings of their governing bodies, general assemblies and appropriate technical meetings, and arrange for co-ordination on Secretariat level; (d) contribute, insofar as they can, and on request by the Director-General, to the promotion of better knowledge and understanding of FAO's program and activities through appropriate forms of publicity; (e) forward to FAO their reports and publications on an exchange basis; (f) keep FAO informed regularly of their programs of work. their planned meetings and of any changes in their constitution, membership and secretariat.

WORLD'S POULTRY SCIENCE ASSOCIATION

Financial Statement

January 1, 1955 to December 31, 1955

	Dr. Heuser	Major Macdougall
Balance January 1, 1955	$ 2,672.29	£1057- 1- 4
Receipts		
Memberships	2,427.70	1127-10- 8
Advertising	1,794.04	107- 5-10
Subscriptions	287.75	7- 5-10
Congress reports and back volumes	62.71	14- 5- 6
Miscellaneous	2.21	———
Transfer from Major Macdougall	2,679.92	———
TOTAL	$ 9,926.62	£1256-11- 7
Expenditures		
Printing Journal (3 issues)	$ 2,317.68	———
Clerical and administrative	304.00	£ 120- 0- 0
Postage	361.46	23-15- 2
Supplies (letterheads, envelopes, forms, stencils, etc.)	147.26	16- 9- 1
Abstracts	54.00	19- 5- 0
Translations	——	7-16- 8
Editor	394.00	———
Associate Editor	216.70	———
Congress Reports	——	14- 0- 0
Taxes	12.40	———
Rebate to Branches	——	71-15- 4
Subscriptions and reprints	20.93	———
Sundry Expenses	——	4- 6-10
Transfer to Savings	2,000.00	———
Transfer to Treasurer	——	964- 0 0
TOTAL	$ 5,828.43	£1241- 8- 1
Balance December 31, 1955	$ 4,098.19	£1072- 4-10
Savings Account		
Balance December 31, 1954	$12,829.03	
Deposits	2,000.00	
Interest	96.21	
Balance December 31, 1955	$14,925.24	
Credit—Suspense account		£ 7- 0- 0
Credit—Tel-Aviv Bank	(Israeli)	£115.845

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Your attention is called to Article XI of the Constitution which reads:

"The annual subscriptions are payable in advance on January 1st of each year to the Treasurer or whom he may designate. In case of failure to pay the subscription before June 1 the Member's name shall be removed from the mailing list of the Journal until renewal of his subscription. In the case of failure to pay the subscription before the end of the year, membership in the Association will be forfeited."

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Individual Membership—$3.00 or One Pound. Members of the United Kingdom Branch should forward 5 shillings additional to Major Macdougall.

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For the convenience of the members in certain countries arrangements have been made for payment of subscriptions to persons in those countries. The following have consented to receive the subscriptions of their respective countries:

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Norway: Leif Svendsen, Norsk Fjoreavlslag, Tollbugt 12, Oslo.

Spain: Senor Luis Latorre, Facultad de Veterinaria, Cordoba.

Sweden: S. Traskman, Sveriges Fjaderfaavelsforening, Vasagatan 5, Stockholm.

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COMMITTEE ON EXHIBITION POULTRY

At the World's Poultry Congress at Leipsic in 1936 a Permanent Committee on Exhibition Poultry was appointed. Very few of the members then appointed are now living or are members of the Association, and the Committee has therefore been moribund. Interest in Exhibition Poultry has been revived among some members, and there has been a request that the Association should re-establish the Committee appointed at Leipsic and that greater interest should be taken in Standard Bred Stock at future Congresses.

It is not possible to re-appoint the Committee until the next Congress is held. However, Mr. C. S. Th. Van Gink, Joh. Vermeerstraat 3, Heemstede, Holland, one of the Association's Vice-Presidents and a member of the original Committee, has expressed his willingness to take up the duties assigned to the original Committee, and to deal with requests for information from national organizations interested in Standard Bred poultry—pending the re-appointment of a similar Committee if that is the Association's wish at the next Congress. Any enquiries or suggestions should therefore be sent to Mr. Van Gink.

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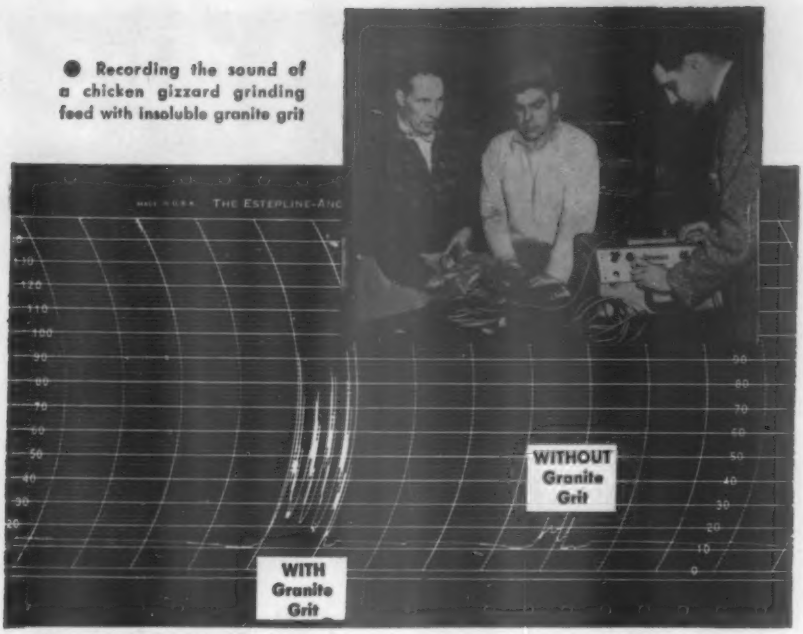

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It is felt by some authorities that the important biological factor of protein quality is oftentimes overshadowed or overlooked due to the significance attached to the mathematical value of a protein-energy ratio. For highest feed efficiency at lowest feed cost, protein quality must be looked upon as being just as important as the amount of protein in the diet.

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Methionine is one of the essential sulfur amino acids necessary for proper amino acid balance and is the one most likely to be deficient in poultry starting rations. Experiments and field results have proved beyond doubt that supplemental methionine will increase feed efficiency and improve feathering and market finish of birds.

Price reductions during the past year make it more practical than ever to include methionine in formulations. In addition, U.S.I. has a wall chart, handy formula, and work sheets that make it simple and easy to estimate methionine requirements of a poultry ration in relation to the energy level. Copies free on request. Write Editor.

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U.S.I. is the pioneer producer of methionine, the low-cost, essential amino acid. Rations that are supplemented with DL-Methionine produce increased return over feed costs and a more rapid growth rate. Methionine is also effective in improving feathering. Your best supply — from U.S.I.

U.S.I. Feed News A Regular Feature

Each month U.S.I. publishes a full page FEED NEWS in the leading publications reaching nutritional and feed formulation specialists. Informative items of interest to all who use feeds and feed supplements are included. Follow this series in U.S. feed publications for new developments in the poultry feeding industry, or send us your name, address and title on your company letterhead to be placed on our mailing list.

FORMULATION SERVICE OFFERED BY U.S.I.

Of particular interest to foreign feed manufacturers is U.S.I.'s formulation service. Special mixes of vitamins, antibiotics and methionine designed to meet your specifications are available. In addition, U.S.I. will be glad to review your formulas in the light of new concepts in nutrition.

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- U.S.I. RIBOFLAVIN Products
- U.S.I. NIACIN
- U.S.I. CALCIUM PANTOTHENATE Products
- U.S.I. DL-METHIONINE (feed grade)
- U.S.I. VITAMIN A & D Products (stabilized)
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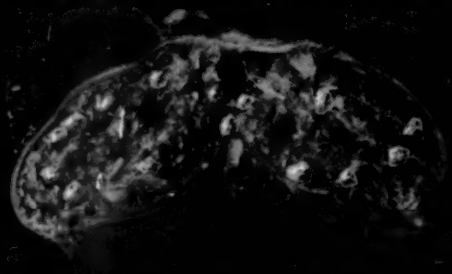

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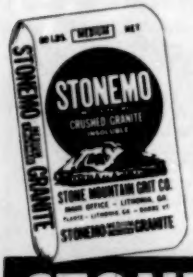

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AQUATRACIN is a similar antibiotic designed for use in the drinking water of poultry and swine. It dissolves rapidly and uniformly. AQUATRACIN is so completely soluble that it can be used in mechanical waterers without any difficulty. There is no sediment to clog the waterers.

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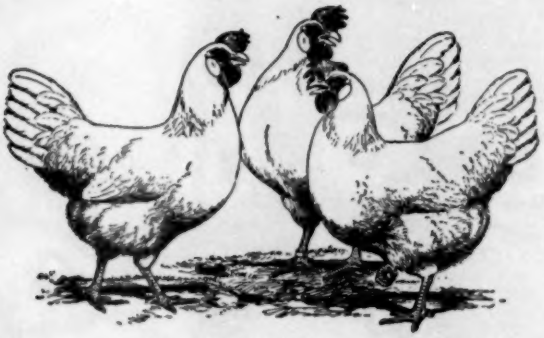

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